SECTION 4

Detailed Analysis of Alternatives

This section presents a detailed analysis of the alternatives developed and described in Section 3. The purpose of the detailed analysis is to provide decision-makers with sufficient information to adequately compare the alternatives, select an appropriate remedy for each site, and demonstrate achievement of RAOs and statutory requirements in the ARARs. The four alternatives developed in Section 3 are analyzed for each of the Inboard Area sites listed in Table 1-8.

4.1 Introduction

The NCP sets forth nine evaluation criteria to address the statutory requirements and the additional technical and policy considerations proven to be important for selection of remedial alternatives. These evaluation criteria serve as the basis for conducting the detailed analysis during this FFS and for subsequently selecting appropriate remedial actions.

The first two criteria overall protection of human health and the environment and compliance with ARARs are termed threshold criteria. Alternatives that do not protect human health and the environment or do not comply with ARARs (or justify a waiver) will not meet statutory requirements for selection of a remedy and therefore, will be eliminated from further consideration. The next five criteria (long-term effectiveness and permanence; reduction of toxicity, mobility, and volume; short-term effectiveness; implementability; and cost) are balancing criteria upon which the remedy selection will be primarily based. CERCLA guidance for conducting feasibility studies lists appropriate questions to be addressed when evaluating an alternative against the balancing criteria (EPA, 1988a). These questions were addressed during the detailed analysis process to provide a consistent basis for evaluation of each of the alternatives. The final two criteria (state [support agency] acceptance and community acceptance) will be evaluated in the Final ROD/RAP.

The U.S. Army is using its lead agency status and authority under CERCLA to implement the environmental restoration activities at HAAF. This FFS is being prepared in accordance with the statutory requirements of the CERCLA, as amended, in an effort to provide protectiveness of human health and the environment.

4.2 Assessment Criteria

The first seven of the nine CERCLA evaluation criteria were evaluated in this FFS and include:

- Overall protection of human health and the environment
- Compliance with ARARs
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, and volume
- Short-term effectiveness

- Implementability
- Cost

The remaining two criteria (state and community acceptance) will be evaluated following public comment on the Draft Final ROD/RAP.

The following sections describe the elements of the nine evaluation criteria used for detailed analysis of the remedial alternatives.

Overall Protection of Human Health and the Environment

This evaluation criterion assesses whether each alternative provides adequate protection of human health and the environment. Protection encompasses such concepts as reduction of risk to acceptable levels, either by concentration reduction or by elimination of potential for exposure, and minimization of threats introduced by actions during remediation, if any. There is substantial overlap between the protection evaluation criterion and the criteria of compliance with ARARs, long-term effectiveness and permanence, and short-term effectiveness. This criterion is a threshold requirement and the primary objective of the remedial program.

Compliance with Applicable or Relevant and Appropriate Requirements

Each alternative is assessed for attainment of federal and state ARARs. When an ARAR can not be met, the basis for justifying an allowed waiver must be presented. Each of the following is addressed for each alternative during the detailed analysis of ARARs:

- Compliance with chemical-specific ARARs, such as maximum contaminant levels
- Compliance with location-specific ARARs, such as wetland regulations
- Compliance with action-specific ARARs, such as closure and post-closure requirements

Long-Term Effectiveness and Permanence

This criterion addresses the results of a remedial action in terms of risk remaining at the site after RAOs have been met. The primary focus of this evaluation is the extent and effectiveness of the controls that may be required to manage the risk posed by treatment residuals and/or untreated residual contamination. The following components of the criterion are addressed for each alternative.

- Magnitude of residual risk: This factor assesses the risk remaining from residual COCs at the conclusion of the proposed activities. The characteristics of the residual COCs will be considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility, and propensity to bioaccumulate.

- Adequacy and reliability of controls: This factor assesses the adequacy and suitability of controls, if any, that are used to manage COCs that remain at the site. It also assesses the long-term reliability of management controls for providing continued protection from residuals and includes an assessment of potential needs for replacement of technical components of the alternative.

Reduction of Toxicity, Mobility, or Volume

This criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies, which permanently and significantly reduce toxicity, mobility, or volume of the contaminants. Permanent and significant reduction can be achieved through destruction of toxic contaminants, reduction of total mass, irreversible reduction in contaminant mobility, or reduction of total volume of contaminated media. This evaluation focuses on the following specific factors for each of the alternatives:

- Treatment processes the remedy will employ, and the materials they will treat
- Amount of hazardous materials that will be destroyed or treated, including how the principal threat(s) will be addressed
- Degree of expected reduction in toxicity, mobility, or volume through treatment as measured as a percentage of reduction
- Degree to which the treatment will be irreversible
- Type and quantity of treatment residuals that will remain following treatment
- Whether the alternative will satisfy the statutory preference for treatment as a principal element.

Short-Term Effectiveness

Under this criterion, alternatives are evaluated with respect to their effects on human health and the environment during the construction and implementation phases of the remedial action. The following factors are addressed for each alternative.

- Protection of the community during remedial actions to address any risk that results from implementation such as fugitive dusts, transportation of hazardous materials, or air-quality impacts from emissions.
- Protection of workers during construction and implementation.
- Environmental impacts that may result from the construction and implementation of the remedial action.
- The amount of time until the RAOs are achieved.
- Implementability

The implementability criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of the required services and materials. Implementability refers to the technical, administrative, and environmental feasibility of implementing an alternative, and the availability of various materials and services required during implementation.

Cost

The detailed cost analysis of alternatives involves estimating the expenditures required to complete each measure in terms of both capital costs and annual operation and maintenance

costs. Once these values have been identified and a present worth calculated for each alternative, a comparative evaluation can be made.

Cost estimates for each alternative are based on site-specific conceptual designs and are expressed in terms of year 2001 dollars. An estimate of this type, according to EPA guidance document (1988a), is usually expected to be accurate within plus 50 percent and minus 30 percent.

Estimates of the area and volume of the potentially contaminated soil are presented in Table 4-1 (located at the end of this section). Computational methodologies and detailed estimates for each Inboard Area Site are presented in Appendix B.

For cost estimation purposes, it was assumed that the upper 2 feet of consolidated site soil would be recontoured to minimize surface depressions, provide final grade, and provide an adequate foundation for the engineered cap. The engineered cap would consist of a 1-foot layer of refuse-free soil seeded with native grasses underlain by a 1-foot low permeability soil layer and a 2-ft foundation layer of reworked and compacted consolidated material.

State Acceptance

This criterion presents the technical and administrative issues and concerns that the state may have regarding each of the alternatives and will be evaluated in the Final ROD/RAP.

Community Acceptance

This criterion presents the issues and concerns the public may have regarding each of the alternatives and will be evaluated in the final ROD/RAP.

4.3 Detailed Analysis of Alternatives

The following presents an evaluation of the site-specific remedial action alternatives:

- Alternative 1 – No Further Action
- Alternative 2 – Institutional Controls
- Alternative 3 – Excavation with Offsite Disposal
- Alternative 4 – Excavation with Onsite Disposal

The evaluation of the alternatives for the first seven of the nine evaluation criteria is based on a conceptual future wetland land-use scenario. The remaining two criteria, state (support agency) acceptance and community acceptance, will be evaluated following receipt of comments on the Draft Final ROD/RAP.

Former Sewage Treatment Plant

The following presents the detailed evaluation for the No Further Action, Institutional Control, Excavation with Offsite Disposal, and Excavation with Onsite Disposal remedial alternatives for the FSTP. Pesticides (alpha-chlordane, gamma-chlordane, DDD, DDE, DDT, dieldrin, and endosulfan sulfate) were the COCs identified in the soil which would pose a potential risk to human and ecological receptors if these receptors were exposed to COCs during the development and maturation of the wetland. Figure B-1 identifies the areas

where remedial action is proposed (i.e., the area where residual concentrations of COCs are detected above their chemical-specific RAOs) at the FSTP.

Alternative 1 – No Further Action

Description

Alternative 1 is No Further Action. No actions would be initiated to control potential site-related risks.

Assessment

Overall Protection of Human Health and the Environment. The No Further Action alternative would not be protective of human health and the environment in the short- or long-term. Although residual COCs are currently located at depths ranging from 2.5 to 10.5 feet bgs, under this alternative potential risks to human health and the environment would exist. The potential risks would exist because throughout the development and maturation of the wetland the potential for erosion or excavation would not be controlled, and the presence of cover would not be monitored. Potential ecological risks would exist for amphipods and the black rail because exposure to pesticides in soil would not be controlled or mitigated. Similarly, potential human health risk (ILCR greater than $1x10^{-6}$) would also exist from ingestion of fish (recreational fishing scenario) containing pesticides (gamma-chlordane and dieldrin). No additional threats would be introduced by this alternative.

Compliance with Applicable or Relevant and Appropriate Requirements. The No Further Action alternative does not achieve the chemical-specific TBC criteria. The COCs would remain in place, and exposure would not be controlled or monitored. Since action is not proposed, there are no action-specific or location-specific ARARs identified for this alternative.

Long-Term Effectiveness and Permanence. The No Further Action alternative is not expected to be effective in the long-term because no remedial actions are proposed. Potential human health and ecological risks have been identified because COCs would remain in place. Potential exposure to COCs would not be controlled or monitored.

Reduction of Toxicity, Mobility, or Volume. The No Further Action alternative does not include any treatment to reduce toxicity, mobility, or volume. Current estimates suggest that approximately 259 yd^3 of soil containing pesticides would remain in place.

Short-Term Effectiveness. No remedial actions are proposed; therefore, the RAOs would not be achieved. Since no remedial actions are proposed, there would not be any short-term risks to the public, worker, and/or environment.

Implementability. The No Further Action alternative would not have implementation obstacles because remedial actions are not proposed. Implementation of this alternative does not introduce additional risks.

Cost. No costs would be associated with implementing the No Further Action alternative.

Alternative 2 – Institutional Controls

Description

Alternative 2 is Institutional Controls. The goal of this alternative is to protect human health and the environment by eliminating the exposure pathway between residual COCs and future wetland receptors. The institutional controls would detail performance criteria specifying that the final design for the wetland must restrict excavation and erosion and monitor the depth of cover in areas where COCs are detected above their chemical-specific RAOs. The final design must maintain at least 3 feet of cover in the areas where COCs are detected above their chemical-specific RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Institutional Controls alternative would be protective of human health and the environment in the short-term and long-term. Pesticides are currently located at depths ranging from 2.5 to 10.5 feet bgs. The institutional controls would detail performance criteria specifying that the final design for the wetland: must provide a minimum of 3 feet of cover, restrict excavation and erosion, and monitor the depth of cover in areas where COCs are detected above their chemical-specific RAOs. The final design must maintain at least 3 feet of cover in the areas where COCs are detected above their chemical-specific RAOs.

Under this alternative, potential ecological risks would not exist for amphipods and the black rail because exposure to chlordanes (amphipods only), total DDTs, dieldrin (amphipods only), and endosulfan sulfate (amphipods only) would be eliminated though implementation of the wetland final design performance criteria (monitoring of cover and protection against erosion and/or excavation). Similarly, potential human health risk (ILCR greater than $1x10^{-6}$) would not exist from ingestion of fish (recreational fishing scenario) because potential fish exposure to pesticides (gamma-chlordane and dieldrin) would be controlled and monitored. No additional threats would be introduced by this alternative.

Compliance with Applicable or Relevant and Appropriate Requirements. The performance criteria specified for the Institutional Controls alternative will meet chemical-specific TBC criteria when 3 feet of stable cover cannot be provided. The alternative would prevent and monitor exposure of receptors to the concentrations of pesticides detected above their chemical-specific RAOs. There are no action-specific or location-specific ARARs identified for this alternative.

Long-Term Effectiveness and Permanence. The Institutional Controls alternative is expected to be effective in the long-term through the use of proprietary and governmental controls. The performance criteria specified in the wetland final design would ensure that a minimum of 3 feet of cover would be provided and restrictions would be implemented on excavation and/or erosion and monitoring of the level of cover throughout the development and maturation of the wetland.

Reduction of Toxicity, Mobility, or Volume. The Institutional Controls alternative does not include any treatment to reduce toxicity, mobility, or volume. Current estimates suggest that approximately 259 yd^3 of soil containing pesticides would remain in place. However, performance criteria for monitoring of cover and prevention of erosion or excavation of cover at the site would eliminate exposure to the residual COCs.

Short-Term Effectiveness. The RAOs to prevent exposure of amphipods and the black rail to pesticides and human ingestion of fish contaminated from pesticides would be achieved by maintaining at least 3 feet of cover in the areas where concentrations of COCs are detected above chemical-specific RAOs (see Figure B-1). Potential risks to workers can be controlled and minimized through proper health and safety procedures.

Implementability. The Institutional Controls alternative would have minimal implementation obstacles because the controls would be fully considered and incorporated in preparation of the final wetland design. The performance criteria and monitoring requirements are easily implementable. Enforcement and verification of the recommendations should be a priority.

Cost. Placement of cover and monitoring of the physical development of the wetland are necessary components of the wetland restoration program regardless of the need for remedial action. The performance criteria are designed to provide flexibility in the development and selection of a final design and are expected to have only a minor impact on design details. Accordingly, there is no significant incremental cost associated with this alternative.

Alternative 3 – Excavation with Offsite Disposal

Description

Alternative 3 is Excavation with Offsite Disposal remedial alternative. Actions to control site-related risks would consist of conducting a pre-design investigation that would include installation of soil borings to determine the excavation geometry. Following the pre-design investigation, soil concentrations of COCs above chemical-specific RAOs would be excavated, transported, and disposed of at an approved offsite landfill. Confirmation samples would be collected to verify that the site achieves RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Excavation and Offsite Disposal alternative would remove soil containing pesticides and therefore, would be protective of human health and the environment in the short- and long-term.

Under this alternative, potential ecological risks would not exist for amphipods and the black rail because soil containing concentrations of pesticides above chemical-specific RAOs would be removed to meet RAOs. Similarly, potential human health risk (ILCR greater than $1x10^{-6}$) would not exist from ingestion of fish (recreational fishing scenario) because potential fish exposure to pesticides (gamma-chlordane and dieldrin) would be eliminated.

Operations associated with the excavations would introduce some potential short-term human health risk due to the potential for direct contact or inhalation of the contaminants by workers during excavation activities. However, these risks can be controlled and minimized through proper health and safety procedures.

Compliance with Applicable or Relevant and Appropriate Requirements. The Excavation and Offsite Disposal alternative is expected to satisfy chemical-specific TBC criteria and location- and action-specific ARARs. The action-specific ARARs would be achieved through implementation of appropriate procedures, management practices, dust suppression, and air monitoring during remedial activities. In conjunction with the offsite disposal option,

excavated soil would be characterized and compared to land ban restrictions prior to transport and disposal. All excavated soil would be managed, handled, and characterized using an approved plan prior to transporting offsite.

Long-Term Effectiveness and Permanence. The Excavation and Offsite Disposal alternative is expected to be effective in the long-term because soil containing pesticides would be physically removed from the site. This would immediately reduce the site risk and achieve RAOs. Removal of the soil would be confirmed with confirmation samples. Excavation would provide the greatest degree of effectiveness and permanence because the concentrations of pesticides detected above chemical-specific RAOs would be removed from the site and disposed of at an appropriate offsite facility.

Reduction of Toxicity, Mobility, or Volume. The Excavation and Offsite Disposal alternative would provide a high degree of mobility reduction because soil containing COCs would be removed from the site. Excavation would achieve the RAOs. Although the soil would be disposed of at an offsite facility, toxicity and volume would not be reduced since no treatment of the soil is proposed.

Short-Term Effectiveness. Excavation would achieve the RAOs at the completion of the removal and disposal activities. There is a potential for release of fugitive dusts during the remedial action activities; however, this would be mitigated by developing and implementing appropriate health and safety procedures. Additionally, there may be short-term risks to the public and/or workers during excavation activities through exposure, handling, and transport of the contaminated materials.

Implementability. The Excavation and Offsite Disposal alternative technology is well established and is technically and administratively implementable. However, the presence of site-specific obstacles, such as the Perimeter Levee and PDD, may complicate excavation and removal activities. During the 1999 Interim Removal Actions (IT, 2000), excavation activities were conducted to the extent practicable in relation to the location of the levee. It was necessary to backfill that portion of the excavation immediately to ensure stability of the levee. Special shoring may be needed during excavation activities.

Cost. Cost estimates are provided in Appendix C. These costs are order-of-magnitude level estimates consistent with EPA requirements for a feasibility study for which cost estimates have an accuracy of plus 50 percent to minus 30 percent. The estimated cost for the excavation and offsite disposal alternative is $61,217.

The cost estimates have been prepared from the best available data at the time of the estimate for guidance in project evaluation and implementation. The final cost of the project would depend on the actual labor and material costs, actual site conditions, final project scope and design, productivity, competitive market conditions, final project schedule, and other variable factors. As a result, the final project costs may vary from those presented in this FFS.

Alternative 4 – Excavation with Onsite Disposal

Description

Alternative 4 is Excavation with Onsite Disposal. Actions to control site-related risks would consist of conducting a pre-design investigation that would include installation of soil

borings to determine the excavation geometry. Following the pre-design investigation, soil containing COCs detected above chemical-specific RAOs would be excavated and transported to an onsite location for consolidation and disposal. Confirmation samples would be collected to verify that the site achieves RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Excavation and Onsite Disposal alternative would remove soil containing pesticides and therefore, would be protective of human health and the environment in the short- and long-term.

Under this alternative, potential ecological risks would not exist for amphipods and black rail because soil containing pesticides detected above chemical-specific RAOs would be removed to meet RAOs. Similarly, potential human health risk (ILCR greater than $1x10^{-6}$) would not exist from ingestion of fish (recreational fishing scenario) because the potential for fish exposure to pesticides (gamma-chlordane and dieldrin) would be eliminated.

Operations associated with the excavations would introduce some potential short-term human health risk due to the potential for direct contact or inhalation of the contaminants by workers during excavation activities. However, these risks can be controlled and minimized through proper health and safety procedures.

Compliance with Applicable or Relevant and Appropriate Requirements. The Excavation and Onsite Disposal alternative is expected to satisfy chemical-specific TBC criteria and location- and action-specific ARARs. The action-specific ARARs would be achieved through implementation of appropriate procedures, management practices, dust suppression, and air monitoring during remedial activities. In conjunction with the onsite disposal option, excavated soil would be characterized prior to transport to the onsite consolidation area for disposal. All excavated soil would be managed, handled, and characterized using an approved plan prior to transporting and consolidating onsite.

Long-Term Effectiveness and Permanence. The Excavation and Onsite Disposal alternative is expected to be effective at the site in the long-term because the soil containing pesticides would be physically removed from the site. This would immediately reduce the site risk. Removal of soil containing COCs would be confirmed with confirmation samples. Excavation would provide the greatest degree of effectiveness and permanence at the site because soil containing COCs would removed from the site. However, the soil are disposed of at an approved onsite consolidation/disposal location; therefore, the contaminants would remain on the BRAC Property.

At the onsite Class II consolidation landfill, post-closure care of the engineered cap would be performed in accordance with appropriate regulations as long as groundwater and/or soil vapor monitoring are in effect. The effectiveness of the landfill cap would be determined through water quality, soil gas, and leachate collection. Monitoring would continue for a minimum of 5 years. At the end of every 5-year period (up to year 30), an evaluation would be performed to determine if a change in monitoring frequency would be appropriate.

Reduction of Toxicity, Mobility, or Volume. The Excavation and Onsite Disposal alternative would reduce mobility at the FSTP because the soil containing the COCs would be removed from the site and disposed at an approved onsite location. Excavation would achieve the

RAOs and reduce the site risks. However, the soil containing the COC would remain on the BRAC Property. There would not be a reduction, but rather a transfer of the contaminant toxicity and volume from the FSTP to the onsite consolidation site. The engineered cap would reduce infiltration of precipitation and potential contaminant migration. Landfill gases (if present) would be passively vented above the breathing zone.

Short-Term Effectiveness. Excavation would achieve the RAOs at the completion of the removal and disposal activities. There is a potential for release of fugitive dusts during the remedial action activities; however, this would be mitigated by developing and implementing appropriate health and safety procedures. Additionally, there may be short-term risks to the public and/or workers during excavation activities through exposure, handling, and transport of soil.

Implementability. The Excavation and Onsite Disposal technology is well established and is implementable both technically and administratively. This alternative may encounter opposition to obtaining a permit for installation of a Class II landfill on the BRAC Property. The excavated materials are expected to be non-hazardous, but would be considered designated waste and would require Class II management. The presence of site-specific obstacles, such as the Perimeter Levee and PDD, may complicate excavation and removal activities. During the 1999 Interim Removal Actions (IT, 2000), excavation activities were conducted to the extent practicable in relation to the location of the levee. It was necessary to backfill that portion of the excavation immediately to ensure stability of the levee. Special shoring may be needed during excavation activities.

At the onsite consolidation site, a Class II non-municipal solid waste landfill would have to be designed, permitted, and installed prior to excavating and transporting site soil from Inboard Area sites for disposal. Following consolidation of all the onsite excavated soil, the consolidation site landfill would require the installation of an engineered cap for closure.

Cost. Cost estimates are provided in Appendix C. These costs are order-of-magnitude level estimates consistent with EPA requirements for a feasibility study for which cost estimates have an accuracy of plus 50 percent to minus 30 percent. The estimated cost for the excavation and onsite disposal alternative is $17,752. This does not include the cost for construction and capping of the consolidation site.

The cost estimates have been prepared from the best available data at the time of the estimate for guidance in project evaluation and implementation. The final cost of the project would depend on the actual labor and material costs, actual site conditions, final project scope and design, productivity, competitive market conditions, final project schedule, and other variable factors. As a result, the final project costs may vary from those presented in this FFS.

Building 26

The following presents the detailed evaluation for the No Further Action, Institutional Control, Excavation with Offsite Disposal, and Excavation with Onsite Disposal remedial alternatives for Building 26. TPH measured as diesel was the COC identified in the soil which would pose a potential risk to ecological receptors if these receptors were exposed to contaminants of concern during the development and maturation of the wetland. Figure B-3

identifies the area where remedial action is proposed (i.e., the area where residual concentrations of COCs are detected above chemical-specific RAOs) at Building 26.

Alternative 1 – No Further Action

Description

Alternative 1 is No Further Action. No actions would be initiated to control potential site-related risks.

Assessment

Overall Protection of Human Health and the Environment. The No Further Action alternative would not be protective of the environment in the short- or long-term. Although the residual COC (TPH measured as diesel) is currently located at depths ranging from 5 to 5.5 feet bgs, under this alternative potential risks to the environment would exist. The potential risk would exist because throughout the development and maturation of the wetland the potential for erosion or excavation would not be controlled and the presence of cover would not be monitored. Under this alternative, potential ecological risks would exist for amphipods because exposure to TPH measured as diesel in soil would not be controlled or mitigated. No additional threats would be introduced by this alternative.

Compliance with Applicable or Relevant and Appropriate Requirements. The No Further Action alternative does not achieve the chemical-specific TBC criteria. The COC would remain in place, and exposure would not be controlled or monitored. Since action is not proposed, there are no action-specific or location-specific ARARs identified for this alternative.

Long-Term Effectiveness and Permanence. The No Further Action alternative is not expected to be effective in the long-term because no remedial actions are proposed. Potential ecological risks have been identified because the COC would remain in place. Potential exposure to the COC would not be controlled or monitored.

Reduction of Toxicity, Mobility, or Volume. The No Further Action alternative does not include any treatment to reduce toxicity, mobility, or volume. Current estimates suggest approximately 46 yd^3 of soil containing TPH measured as diesel would remain in place.

Short-Term Effectiveness. No remedial actions are proposed; therefore, the RAOs would not be achieved. Since no remedial actions are proposed, there would not be any short-term risks to the public, worker, and/or environment.

Implementability. The No Further Action alternative would not have implementation obstacles because remedial actions are not proposed. Implementation of this alternative does not introduce additional risks.

Cost. No costs would be associated with implementing the No Further Action alternative.

Alternative 2 – Institutional Controls

Description

Alternative 2 is Institutional Controls. The goal of this alternative is to protect human health and the environment by eliminating the exposure pathway between residual COCs and future wetland receptors. The institutional controls would detail performance criteria

specifying that the final design for the wetland must restrict excavation and erosion and monitor the depth of cover in areas where COCs are detected above chemical-specific RAOs. The final design must maintain at least 3 feet of cover in the areas where COCs are detected above chemical-specific RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Institutional Controls alternative would be protective of the environment in the short- and long-term. TPH measured as diesel is currently located at depths ranging from 5 to 5.5 feet bgs. The institutional controls would detail performance criteria specifying that the final design for the wetland must restrict excavation and erosion and monitor the depth of cover in areas where TPH measured as diesel is detected above chemical–specific RAO. The final design must maintain at least 3 feet of cover in the areas where COCs are detected above chemical-specific RAOs.

Under this alternative, potential ecological risks would not exist for amphipods because exposure to TPH measured as diesel would be eliminated through implementation of the wetland final design performance criteria (monitoring of cover and protection against erosion and/or excavation). No additional threats would be introduced by this alternative.

Compliance with Applicable or Relevant and Appropriate Requirements. The performance criteria specified for the Institutional Controls alternative will meet chemical-specific TBC criteria when 3 feet of stable cover cannot be provided. The alternative would prevent and monitor exposure of receptors to concentrations of TPH measured as diesel detected above chemical-specific RAO. There are no action-specific or location-specific ARARs identified for this alternative.

Long-Term Effectiveness and Permanence. The Institutional Controls alternative is expected to be effective in the long-term through the use of proprietary and governmental controls. The performance criteria specified in the wetland final design would ensure implementation of restrictions on excavation and/or erosion and monitoring of the level of cover throughout the development and maturation of the wetland.

Reduction of Toxicity, Mobility, or Volume. The Institutional Controls alternative does not include any treatment to reduce toxicity, mobility, or volume. Current estimates suggest approximately 46 yd^3 of soil containing the residual COC would remain in place. However, performance criteria for monitoring of cover and prevention of erosion or excavation of cover at the site would eliminate exposure to the residual COC.

Short-Term Effectiveness. The RAO to prevent exposure of amphipods to TPH measured as diesel would be achieved by maintaining at least 3 feet of cover in the area concentrations are above the chemical-specific RAO (see Figure B-3). Potential risks to workers can be controlled and minimized through proper health and safety procedures.

Implementability. The Institutional Controls alternative would have minimal implementation obstacles because the controls would be fully considered and incorporated in preparation of the final wetland design. The performance criteria and monitoring requirements are easily implementable. Enforcement and verification of the recommendations should be a priority.

Cost. Placement of cover and monitoring of the physical development of the wetland are necessary components of the wetland restoration program regardless of the need for remedial action. The performance criteria are designed to provide flexibility in the development and selection of final design and are expected to have only a minor impact on design details. Accordingly, there is no significant incremental cost associated with this alternative.

Alternative 3 – Excavation with Offsite Disposal Description

Alternative 3 is Excavation with Offsite Disposal. Actions to control site-related risks would consist of conducting a pre-design investigation that would include installation of soil borings to determine the excavation geometry. Following the pre-design investigation, soil with concentrations of COCs detected above chemical-specific RAOs would be excavated, transported, and disposed at an approved offsite landfill. Confirmation samples would be collected to verify that the site achieves RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Excavation and Offsite Disposal alternative would remove soil containing TPH measured as diesel and therefore, would be protective of the environment in the short-term and long-term.

Under this alternative, potential ecological risks would not exist for amphipods because soil containing concentrations of TPH-measured as diesel detected above chemical-specific RAO would be removed to meet the RAO.

Operations associated with the excavations would introduce some potential short-term human health risks due to the potential for direct contact or inhalation of the contaminants by workers during excavation activities. However, these risks can be controlled and minimized through proper health and safety procedures.

Compliance with Applicable or Relevant and Appropriate Requirements. The Excavation and Offsite Disposal alternative is expected to satisfy chemical-specific TBC criteria and location- and action-specific ARARs. The action-specific ARARs would be achieved through implementation of appropriate procedures, management practices, dust suppression, and air monitoring during remedial activities. In conjunction with the offsite disposal option, excavated soil would be characterized and compared to land ban restrictions prior to transport and disposal. All excavated soil would be managed, handled, and characterized using an approved plan prior to transporting offsite.

Long-Term Effectiveness and Permanence. The Excavation and Offsite Disposal alternative is expected to be effective in the long-term because soil containing the COC would be physically removed from the site. This would immediately reduce the site risks and achieve RAOs. Removal of the soil would be confirmed with confirmation samples. Excavation would provide the greatest degree of effectiveness and permanence because the concentrations of TPH measured as diesel detected above chemical-specific RAOs would be removed from the site and disposed of at an appropriate offsite facility.

Reduction of Toxicity, Mobility, or Volume. The Excavation and Offsite Disposal alternative would provide a high degree of mobility reduction because the soil containing the COC would be removed from the site. Excavation would achieve RAOs. Although the soil would

be disposed at an offsite facility, toxicity and volume would not be reduced since no treatment of the soil is proposed.

Short-Term Effectiveness. Excavation would achieve the RAOs at the completion of the removal and disposal activities. There is a potential for release of fugitive dusts during the remedial action activities; however, this would be mitigated by developing and implementing appropriate health and safety procedures. Additionally, there may be short-term risks to the public and/or workers during excavation activities through exposure, handling, and transport of the contaminated materials.

Implementability. The Excavation and Offsite Disposal alternative technology is well established and is technically and administratively implementable. However, the presence of site specific obstacles, such as having to remove the backfill material used to fill UST excavation prior to conducting proposed excavation activities, may complicate excavation and removal activities. Also, the location of Building 26 would limit the extent of excavation to the northeast. There are no other site-specific obstacles that should complicate excavation and removal activities.

Cost. Cost estimates are provided in Appendix C. These costs are order-of-magnitude level estimates consistent with EPA requirements for a feasibility study for which cost estimates have an accuracy of plus 50 percent to minus 30 percent. The estimated cost for the excavation and offsite disposal alternative is $23,610.

The cost estimates have been prepared from the best available data at the time of the estimate for guidance in project evaluation and implementation. The final cost of the project would depend on the actual labor and material costs, actual site conditions, final project scope and design, productivity, competitive market conditions, final project schedule, and other variable factors. As a result, the final project costs may vary from those presented in this FFS.

Alternative 4 – Excavation with Onsite Disposal

Description

Alternative 4 is Excavation with Onsite Disposal. Actions to control site-related risks would consist of conducting a pre-design investigation that would include installation of soil borings to determine the excavation geometry. Following the pre-design investigation, soil containing COCs detected above their chemical-specific RAOs would be excavated and transported to an onsite location for consolidation and disposal. Confirmation samples would be collected to verify that the site achieves RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Excavation and Onsite Disposal alternative would remove soil containing TPH measured as diesel and therefore would be protective of the environment in the short-term and long-term.

Under this alternative, potential ecological risks would not exist for amphipods because soil containing concentrations of TPH measured as diesel detected above chemical-specific RAO would be removed to meet RAOs.

Operations associated with the excavations would introduce some potential short-term human health risks due to the potential for direct contact or inhalation of the contaminants

by workers during excavation activities. However, these risks can be controlled and minimized through proper health and safety procedures.

Compliance with Applicable or Relevant and Appropriate Requirements. The Excavation and Onsite Disposal alternative is expected to satisfy chemical-specific TBC criteria and location- and action-specific ARARs. The action-specific ARARs would be achieved through implementation of appropriate procedures, management practices, dust suppression, and air monitoring during remedial activities. In conjunction with the onsite disposal option, excavated soil would be characterized prior to transport to the onsite consolidation area for disposal. All excavated soil would be managed, handled, and characterized using an approved plan prior to transporting and consolidating onsite.

Long-Term Effectiveness and Permanence. The Excavation and Onsite Disposal alternative is expected to be effective in the long-term because the soil containing TPH measured as diesel would be physically removed from the site, which would immediately reduce the site risk. Removal of soil containing COCs would be confirmed with confirmation samples. Excavation would provide the greatest degree of effectiveness and permanence at the site because the soil containing the COC would be removed from the site. However, the soil would be disposed at an approved onsite consolidation/disposal location; therefore, the contaminants would remain on the BRAC Property.

At the onsite Class II consolidation landfill, post-closure care of the engineered cap would be performed in accordance with appropriate regulations as long as groundwater and/or soil vapor monitoring are in effect. The effectiveness of the landfill cap would be determined through water quality, soil gas, and leachate collection. Monitoring would continue for a minimum of 5 years. At the end of every 5-year period (up to year 30) an evaluation would be performed to determine if a change in monitoring frequency would be appropriate.

Reduction of Toxicity, Mobility, or Volume. The Excavation and Onsite Disposal alternative would reduce mobility at Building 26 because the soil containing the COC would be removed from the site and disposed at an approved onsite location. Excavation would achieve the RAOs and reduce the site risks. However, soil containing the COC would remain on the BRAC Property. There would not be a reduction, but rather a transfer of toxicity and volume from Building 26 to the onsite consolidation site. The engineered cap would reduce infiltration of precipitation and potential contaminant migration. Landfill gases (if present) would be passively vented above the breathing zone.

Short-Term Effectiveness. Excavation would achieve the RAOs at the completion of the removal and disposal activities. There is a potential for release of fugitive dusts during the remedial action activities; however, this would be mitigated by developing and implementing appropriate health and safety procedures. Additionally, there may be short-term risks to the public and/or workers during excavation activities through exposure, handling, and transport of soil.

Implementability. The Excavation and Onsite Disposal technology is well established and is implementable both technically and administratively. This alternative may encounter opposition to obtaining a permit for installation of a Class II landfill on the BRAC property. The excavated materials are expected to be nonhazardous but would be considered

designated waste and would require Class II management. The presence of site specific obstacles, such as having to remove the backfill material used to fill UST excavation prior to conducting proposed excavation activities. Also, the location of Building 26 would limit the extent of excavation to the northeast.

At the onsite consolidation site, a Class II non-municipal solid waste landfill would have to be designed, permitted, and installed prior to excavating and transporting soil from Inboard Area site for disposal. Following consolidation of all the onsite excavated soil, the consolidation site landfill would require the installation of an engineered cap for closure.

Cost. Cost estimates are provided in Appendix C. These costs are order-of-magnitude level estimates consistent with EPA requirements for a feasibility study for which cost estimates have an accuracy of plus 50 percent to minus 30 percent. The estimated cost for the excavation and onsite disposal alternative is $9,696. This does not include the cost for construction and capping of the consolidation site.

The cost estimates have been prepared from the best available data at the time of the estimate for guidance in project evaluation and implementation. The final cost of the project would depend on the actual labor and material costs, actual site conditions, final project scope and design, productivity, competitive market conditions, final project schedule, and other variable factors. As a result, the final project costs may vary from those presented in this FFS.

Building 35/39 Area

The following presents the detailed evaluation for the No Further Action, Institutional Control, Excavation with Offsite Disposal, and Excavation with Onsite Disposal remedial alternatives for the Building 35/39 Area. Pesticides (DDD, DDE, and DDT) were the COCs identified in the soil which would pose a potential risk ecological receptors if these receptors were exposed to residual COCs during the development and maturation of the wetland. Figure B-4 identifies the areas where remedial action is proposed (i.e., the areas where residual concentrations of COCs are above chemical-specific RAOs) at the Building 35/39 Area.

Alternative 1 – No Further Action

Description

Alternative 1 is No Further Action. No actions would be initiated to control potential site-related risks.

Assessment

Overall Protection of Human Health and the Environment. The No Further Action alternative would not be protective of the environment in the short- or long-term. Although residual COCs are currently located at depths ranging from 3 to 4.5 feet bgs, under this alternative potential risks to the environment would exist. The potential risk would exist because throughout the development and maturation of the wetland the potential for erosion or excavation would not be controlled and the presence of cover would not be monitored. Under this alternative, potential ecological risks would exist for amphipods, bay shrimp, algae, and black rail because exposure to pesticides in soil would not be controlled or mitigated. No additional threats would be introduced by this alternative.

Compliance with Applicable or Relevant and Appropriate Requirements. The No Further Action alternative does not achieve the chemical-specific TBC criteria. The COCs would remain in place, and exposure would not be controlled or monitored. Since action is not proposed, there are no action-specific or location-specific ARARs identified for this alternative.

Long-Term Effectiveness and Permanence. The No Further Action alternative is not expected to be effective in the long-term because no remedial actions are proposed. Potential human health and ecological risks have been identified because COCs would remain in place. Potential exposure to COCs would not be controlled or monitored.

Reduction of Toxicity, Mobility, or Volume. The No Further Action alternative does not include any treatment to reduce toxicity, mobility, or volume. Current estimates suggest that approximately 25 yd^3 of soil containing pesticides would remain in place.

Short-Term Effectiveness. No remedial actions are proposed; therefore, the RAOs would not be achieved. Since no remedial actions are proposed, there would not be any short-term risks to the public, worker, and/or environment.

Implementability. The No Further Action alternative would not have implementation obstacles because remedial actions are not proposed. Implementation of this alternative does not introduce additional risks.

Cost. No costs would be associated with implementing the No Further Action alternative.

Alternative 2 – Institutional Controls

Description

Alternative 2 is Institutional Controls. The goal of this alternative is to protect human health and the environment by eliminating the exposure pathway between residual COCs and future wetland receptors. The institutional controls would detail performance criteria specifying that the final design for the wetland must restrict excavation and erosion and monitor the depth of cover in areas where COCs are detected above their chemical-specific RAOs. The final design must maintain at least 3 feet of cover in the areas where COCs are detected above their chemical-specific RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Institutional Controls alternative would be protective of the environment in the short-term and long-term. Pesticides are currently located at depths ranging from 3 to 4.5 feet bgs. The institutional controls would detail performance criteria specifying that the final design for the wetlands must: restrict excavation and erosion and monitor the depth of cover in areas where COCs are detected above chemical-specific RAOs. The final design must maintain at least 3 feet of cover in the areas where COCs are detected above their chemical-specific RAOs.

Under this alternative, potential ecological risks would not exist for amphipods, bay shrimp, algae, and black rail because exposure to pesticides in soil would be eliminated through implementation of the wetland final design performance criteria (monitoring of cover and protection against erosion and/or excavation). No additional threats would be introduced by this alternative.

Compliance with Applicable or Relevant and Appropriate Requirements. The performance criteria specified for the Institutional Controls alternative will meet chemical-specific TBC criteria when 3 feet of stable cover cannot be provided. The alternative would prevent and monitor exposure of receptors to concentrations of COCs detected above chemical-specific RAOs. There are no action-specific or location-specific ARARs identified for this alternative.

Long-Term Effectiveness and Permanence. The Institutional Controls alternative is expected to be effective in the long-term through the use of proprietary and governmental controls. The performance criteria specified in the wetland final design would ensure implementation of restrictions on excavation and/or erosion and monitoring of the level of cover throughout the development and maturation of the wetland.

Reduction of Toxicity, Mobility, or Volume. The Institutional Controls alternative does not include any treatment to reduce toxicity, mobility, or volume. Current estimates suggest that approximately 25 yd^3 of soil containing pesticides would remain in place. However, performance criteria for monitoring of cover and prevention of erosion or excavation of cover at the site would eliminate exposure to pesticides detected above chemical-specific RAOs.

Short-Term Effectiveness. The RAO to prevent exposure of amphipods, bay shrimp, algae and black rail to pesticides would be achieved by maintaining at least 3 feet of cover in the area concentrations are above the chemical specific RAO (see Figure B-4). Potential risks to workers can be controlled and minimized through proper health and safety procedures.

Implementability. The Institutional Controls alternative would have minimal implementation obstacles because the controls would be fully considered and incorporated in preparation of the final wetland design. The performance criteria and monitoring requirements are easily implementable. Enforcement and verification of the recommendations should be a priority.

Cost. Placement of cover and monitoring of the physical development of the wetland are necessary components of the wetland restoration program regardless of the need for remedial action. The performance criteria are designed to provide flexibility in the development and selection of final design and are expected to have only a minor impact on design details. Accordingly, there is no significant incremental cost associated with this alternative.

Alternative 3 – Excavation with Offsite Disposal

Description

Alternative 3 is Excavation with Offsite Disposal remedial alternative. Actions to control site-related risks would consist of conducting a pre-design investigation that would include installation of soil borings to determine the excavation geometry. Following the pre-design investigation, soil concentrations of COCs above chemical-specific RAOs would be excavated, transported, and disposed at an approved off site landfill. Confirmation samples would be collected to verify that the site achieves RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Excavation and Offsite Disposal alternative would remove soil containing pesticides and therefore would be protective of the environment in the short-term and long-term.

Under this alternative, potential ecological risks would not exist for amphipods, bay shrimp, algae and black rail because soil containing concentrations pesticides detected above their chemical-specific RAOs would be removed to meet RAOs.

Operations associated with the excavations would introduce some potential short-term human health risks due to the potential for direct contact or inhalation of the contaminants by workers during excavation activities. However, these risks can be controlled and minimized through proper health and safety procedures.

Compliance with Applicable or Relevant and Appropriate Requirements. The Excavation and Offsite Disposal alternative is expected to satisfy chemical-specific TBC criteria and location- and action-specific ARARs. The action-specific ARARs would be achieved through implementation of appropriate procedures, management practices, dust suppression, and air monitoring during remedial activities. In conjunction with the offsite disposal option, excavated soil would be characterized and compared to land ban restrictions prior to transport and disposal. All excavated soil would be managed, handled, and characterized using an approved plan prior to transporting offsite.

Long-Term Effectiveness and Permanence. The Excavation and Offsite Disposal alternative is expected to be effective in the long-term because soil containing pesticides would be physically removed from the site. This would immediately reduce the site risks and achieve RAOs. Removal of the soil would be confirmed with confirmation samples. Excavation would provide the greatest degree of effectiveness and permanence because the concentrations of pesticides detected above chemical-specific RAOs would be removed from the site and disposed of at an appropriate offsite facility.

Reduction of Toxicity, Mobility, or Volume. The Excavation and Offsite Disposal alternative would provide a high degree of mobility reduction because the soil containing COCs would be removed from the site. Excavation would achieve RAOs. Although the soil would be disposed of at an offsite facility, toxicity and volume would not be reduced since no treatment of the soil is proposed.

Short-Term Effectiveness. Excavation would achieve the RAOs at the completion of the removal and disposal activities. There is a potential for release of fugitive dusts during the remedial action activities; however, this would be mitigated by developing and implementing appropriate health and safety procedures. Additionally, there may be short-term risks to the public and/or workers during excavation activities through exposure, handling, and transport of the contaminated materials.

Implementability. The Excavation and Offsite Disposal alternative technology is well established and is technically and administratively implementable. However, the presence of site-specific obstacles, such as the discharge pipe and concrete sump, may complicate excavation and removal activities. During the 1999 Interim Removal Actions (IT, 2000), excavation activities were conducted to the extent practicable in relation to the location of

these structures. It was necessary to backfill that portion of the excavation immediately to ensure stability. Special shoring may be needed during excavation activities.

Cost. Cost estimates are provided in Appendix C. These costs are order-of-magnitude level estimates consistent with EPA requirements for a feasibility study for which cost estimates have an accuracy of plus 50 percent to minus 30 percent. The estimated cost for the excavation and offsite disposal alternative is $17,384.

The cost estimates have been prepared from the best available data at the time of the estimate for guidance in project evaluation and implementation. The final cost of the project would depend on the actual labor and material costs, actual site conditions, final project scope and design, productivity, competitive market conditions, final project schedule, and other variable factors. As a result, the final project costs may vary from those presented in this FFS.

Alternative 4 – Excavation with Onsite Disposal

Description

Alternative 4 is Excavation with Onsite Disposal. Actions to control site-related risks would consist of conducting a pre-design investigation that would include installation of soil borings to determine the excavation geometry. Following the pre-design investigation, soil containing COCs detected above chemical-specific RAOs would be excavated and transported to an onsite location for consolidation and disposal. Confirmation samples would be collected to verify that the site achieves RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Excavation and Offsite Disposal alternative would remove soil containing pesticides and therefore, would be protective of the environment in the short- and long-term.

Under this alternative, potential ecological risks would not exist for amphipods, bay shrimp, algae and the black rail because soil containing concentrations pesticides detected above chemical-specific ARARs would be removed to meet RAOs.

Operations associated with the excavations would introduce some potential short-term human health risks due to the potential for direct contact or inhalation of the contaminants by workers during excavation activities. However, these risks can be controlled and minimized through proper health and safety procedures.

Compliance with Applicable or Relevant and Appropriate Requirements. The Excavation and Onsite Disposal alternative is expected to satisfy chemical-specific TBC criteria and location- and action-specific ARARs. The action-specific ARARs would be achieved through implementation of appropriate procedures, management practices, dust suppression, and air monitoring during remedial activities. In conjunction with the onsite disposal option, excavated soil would be characterized prior to transport to the onsite consolidation area for disposal. All excavated soil would be managed, handled, and characterized using an approved plan prior to transporting and consolidating onsite.

Long-Term Effectiveness and Permanence. The Excavation and Onsite Disposal alternative is expected to be effective in the long-term because the soil containing pesticides would be physically removed from the site. This would immediately reduce the site risk. Removal of

soil containing COCs would be confirmed with confirmation samples. Excavation would provide the greatest degree of effectiveness and permanence at the site because the soil containing the COCs would be removed from the site. However, the soil would be disposed at an approved onsite consolidation/disposal location; therefore, the contaminants would remain on the BRAC Property.

At the onsite Class II consolidation landfill, post-closure care of the engineered cap would be performed in accordance with appropriate regulations as long as groundwater and/or soil vapor monitoring are in effect. The effectiveness of the landfill cap would be determined through water quality, soil gas, and leachate collection. Monitoring would continue for a minimum of 5 years. At the end of every 5-year period (up to year 30) an evaluation would be performed to determine if a change in monitoring frequency would be appropriate.

Reduction of Toxicity, Mobility, or Volume. The Excavation and Onsite Disposal alternative would reduce mobility at the Building 35/39 Area because the soil containing the COCs would be removed from the site and disposed at an approved onsite location. Excavation would achieve the RAOs and reduce the site risks. However, soil containing the COCs would remain on the BRAC Property. There would not be a reduction, but rather a transfer of toxicity and volume from the Building 35/39 Area to the onsite consolidation site. The engineered cap would reduce infiltration of precipitation and potential contaminant migration. Landfill gases (if present) would be passively vented above the breathing zone.

Short-Term Effectiveness. Excavation would achieve the RAOs at the completion of the removal and disposal activities. There is a potential for release of fugitive dusts during the remedial action activities; however, this would be mitigated by developing and implementing appropriate health and safety procedures. Additionally, there may be short-term risks to the public and/or workers during excavation activities through exposure, handling, and transport of soil.

Implementability. The Excavation and Onsite Disposal technology is well established and is technically and administratively implementable. This alternative may encounter opposition to obtaining a permit for installation of a Class II landfill on the BRAC Property. The excavated materials are expected to be nonhazardous, but would be considered designated waste and would require Class II management. The presence of site-specific obstacles, such as the outfall pipe and concrete sump, may complicate excavation and removal activities. During the 1999 Interim Removal Actions (IT, 2000), excavation activities were conducted to the extent practicable in relation to the location of these structures. It was necessary to backfill that portion of the excavation immediately to ensure stability. Special shoring may be needed during excavation activities.

At the onsite consolidation site, a Class II non-municipal solid waste landfill would have to be designed, permitted, and installed prior to excavating and transporting soil from the Inboard Area site for disposal. Following consolidation of all the onsite excavated soil, the landfill would require the installation of an engineered cap for closure.

Cost. Cost estimates are provided in Appendix C. These costs are order-of-magnitude level estimates consistent with EPA requirements for a feasibility study for which cost estimates have an accuracy of plus 50 percent to minus 30 percent. The estimated cost for the

excavation and onsite disposal alternative is $9,947. This does not include the cost for construction and capping of the consolidation site.

The cost estimates have been prepared from the best available data at the time of the estimate for guidance in project evaluation and implementation. The final cost of the project would depend on the actual labor and material costs, actual site conditions, final project scope and design, productivity, competitive market conditions, final project schedule, and other variable factors. As a result, the final project costs may vary from those presented in this FFS.

Building 41 Area

The following presents the detailed evaluation for the No Further Action, Institutional Control, Excavation with Offsite Disposal, and Excavation with Onsite Disposal remedial alternatives for the Building 41 Area. TPH measured as diesel and PAHs were the COCs identified in the soil which would pose a potential risk to ecological receptors if these receptors were exposed to contaminants of concern during the development and maturation of the wetland. Figure B-5 identifies the areas where remedial action is proposed (i.e., the areas where residual concentrations of COCs are above chemical-specific RAOs) at the Building 41 area.

Alternative 1 – No Further Action

Description

Alternative 1 is No Further Action. No actions would be initiated to control potential site-related risks.

Assessment

Overall Protection of Human Health and the Environment. The No Further Action alternative would not be protective of the environment in the short-term or long-term. Although residual COCs are currently located at depths ranging from 2.5 to 18.5 feet bgs, under this alternative potential risk to the environment would exist. The potential risk would exist because Building 41 would be removed during wetland construction activities and throughout the development and maturation of the wetland the potential for erosion or excavation would not be controlled and the presence of cover would not be monitored. Under this alternative, potential ecological risks would exist for pickleweed and amphipods because exposure to TPH measured as diesel (amphipod only) and PAHs in soil would not be controlled or mitigated. No additional threats would be introduced by this alternative.

Compliance with Applicable or Relevant and Appropriate Requirements. The No Further Action alternative does not achieve the chemical-specific TBC criteria. The COCs would remain in place, and exposure would not be controlled or monitored. Since action is not proposed, there are no action-specific or location-specific ARARs identified for this alternative.

Long-Term Effectiveness and Permanence. The No Further Action alternative is not expected to be effective in the long-term because no remedial actions are proposed. Potential ecological risks have been identified because COCs would remain in place. Potential exposure to COCs would not be controlled or monitored.

Reduction of Toxicity, Mobility, or Volume. The No Further Action alternative does not include any treatment to reduce toxicity, mobility, or volume. Current estimates suggest that approximately 907 yd^3 of soil containing TPH measured as diesel and PAHs would remain in place.

Short-Term Effectiveness. No remedial actions are proposed; therefore, the RAOs would not be achieved. Since no remedial actions are proposed, there would not be any short-term risks to the public, worker, and/or environment.

Implementability. The No Further Action alternative would not have implementation obstacles because remedial actions are not proposed. Implementation of this alternative does not introduce additional risks.

Cost. No costs would be associated with implementing the No Further Action alternative.

Alternative 2 – Institutional Controls

Description

Alternative 2 is Institutional Controls. The goal of this alternative is to protect human health and the environment by eliminating the exposure pathway between residual COCs and future wetland receptors. The institutional controls would detail performance criteria specifying that the final design for the wetland must restrict excavation and erosion and monitor the depth of cover in areas where COCs are detected above their chemical-specific RAOs. The final design must maintain at least 3 feet of cover in the areas where COCs are detected above chemical-specific RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Institutional Controls alternative would be protective of human health and the environment in the short- and long-term. TPH measured as diesel and PAHs are currently located at depths ranging from 2.5 to 18.5 feet bgs. The institutional controls would detail performance criteria specifying that the final design for the wetland must restrict excavation and erosion and monitor depth of cover in areas where COCs are detected above chemical-specific RAO's. The final design must maintain at least 3 feet of cover in the areas where COCs are detected above chemical-specific RAOs.

Under this alternative, potential ecological risks would not exist for pickleweed and amphipods because exposure to TPH measured as diesel and PAHs in soil would be eliminated through implementation of the wetland final design performance criteria (monitoring of cover and protection against erosion and/or excavation). No additional threats would be introduced by this alternative.

Compliance with Applicable or Relevant and Appropriate Requirements. The performance criteria specified for the Institutional Controls alternative will meet chemical-specific TBC criteria when 3 feet of stable cover cannot be provided. The alternative would prevent and monitor exposure of receptors to concentrations of TPH measured as diesel and PAHs detected above chemical-specific RAOs. There are no action-specific or location-specific ARARs identified for this alternative.

Long-Term Effectiveness and Permanence. The Institutional Controls alternative is expected to be effective in the long-term through the use of proprietary and governmental controls.

The performance criteria specified in the wetland final design would ensure implementation of restrictions on excavation and/or erosion and monitoring of the level of cover throughout the development and maturation of the wetland.

Reduction of Toxicity, Mobility, or Volume. The Institutional Controls alternative does not include any treatment to reduce toxicity, mobility, or volume. Current estimates suggest that approximately 907 yd^3 of soil containing TPH measured as diesel and PAHs would remain in place. However, performance criteria for monitoring of cover and prevention of erosion or excavation of cover at the site would eliminate exposure to pesticides detected above chemical-specific RAOs.

Short-Term Effectiveness. The RAO to prevent exposure of pickleweed and amphipods to TPH measured as diesel and PAHs would be achieved by maintaining at least 3 feet of cover in the areas where concentrations are detected above chemical-specific RAOs (see Figure B-5). Potential risks to workers can be controlled and minimized through proper health and safety procedures.

Implementability. The Institutional Controls alternative would have minimal implementation obstacles because the controls would be fully considered and incorporated in preparation of the final wetland design. The performance criteria and monitoring requirements are easily implementable. Enforcement and verification of the recommendations should be a priority.

Cost. Placement of cover and monitoring of the physical development of the wetland are necessary components of the wetland restoration program regardless of the need for remedial action. The performance criteria are designed to provide flexibility in the development and selection of final design and are expected to have only a minor impact on design details. Accordingly, there is no significant incremental cost associated with this alternative.

Alternative 3 – Excavation with Offsite Disposal

Description

Alternative 3 is Excavation with Offsite Disposal remedial alternative. Actions to control site-related risks would consist of conducting a pre-design investigation that would include installation of soil borings to determine the excavation geometry. Following the pre-design investigation, soil concentrations of COCs above their chemical-specific RAOs would be excavated, transported, and disposed at an approved off site landfill. Confirmation samples would be collected to verify that the site achieves RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Excavation and Offsite Disposal alternative would remove soil containing TPH measured as diesel and PAHs and therefore, would be protective of the environment in the short- and long-term.

Under this alternative, potential ecological risks would not exist for pickleweed and amphipods because soil containing concentrations TPH measured as diesel and PAHs detected above chemical-specific RAOs would be removed to meet RAOs.

Operations associated with the excavations would introduce some potential short-term human health risks due to the potential for direct contact or inhalation of the contaminants

by workers during excavation activities. However, these risks can be controlled and minimized through proper health and safety procedures.

Compliance with Applicable or Relevant and Appropriate Requirements. The Excavation and Offsite Disposal alternative is expected to satisfy chemical-specific TBC criteria and location- and action-specific ARARs. The action-specific ARARs would be achieved through implementation of appropriate procedures, management practices, dust suppression, and air monitoring during remedial activities. In conjunction with the offsite disposal option, excavated soil would be characterized and compared to land ban restrictions prior to transport and disposal. All excavated soil would be managed, handled, and characterized using an approved plan prior to transporting offsite.

Long-Term Effectiveness and Permanence. The Excavation and Offsite Disposal alternative is expected to be effective in the long-term because soil containing TPH measured as diesel and PAHs would be physically removed from the site. This would immediately reduce the site risks and achieve RAOs. Removal of the soil would be confirmed with confirmation samples. Excavation would provide the greatest degree of effectiveness and permanence because the concentrations of TPH measured as diesel and PAHs detected above their chemical-specific RAOs would be removed from the site and disposed of at an appropriate offsite facility.

Reduction of Toxicity, Mobility, or Volume. The Excavation and Offsite Disposal alternative would provide a high degree of mobility reduction because the soil containing COCs would be removed from the site. Excavation would achieve RAOs. Although the soil would be disposed of at an offsite facility, toxicity and volume would not be reduced since no treatment of the soil is proposed.

Short-Term Effectiveness. Excavation would achieve the RAOs at the completion of the removal and disposal activities. There is a potential for release of fugitive dusts during the remedial action activities; however, this would be mitigated by developing and implementing appropriate health and safety procedures. Additionally, there may be short-term risks to the public and/or workers during excavation activities through exposure, handling, and transport of the contaminated materials.

Implementability. The Excavation and Offsite Disposal alternative technology is well established and is technically and administratively implementable. However, the presence of site-specific obstacles, such as the Perimeter Levee, concrete and asphalt, a power pole, the PDD, and Building 41 may complicate excavation and removal activities. There are no other site-specific obstacles that should complicate excavation and removal activities.

Cost. Cost estimates are provided in Appendix C. These costs are order-of-magnitude level estimates consistent with EPA requirements for a feasibility study for which cost estimates have an accuracy of plus 50 percent to minus 30 percent. The estimated cost for the excavation and offsite disposal alternative is $297,018.

The cost estimates have been prepared from the best available data at the time of the estimate for guidance in project evaluation and implementation. The final cost of the project would depend on the actual labor and material costs, actual site conditions, final project scope and design, productivity, competitive market conditions, final project schedule, and

other variable factors. As a result, the final project costs may vary from those presented in this FFS.

Alternative 4 – Excavation with Onsite Disposal

Description

Alternative 4 is Excavation with Onsite Disposal. Actions to control site-related risks would consist of conducting a pre-design investigation that would include installation of soil borings to determine the excavation geometry. Following the pre-design investigation, soil containing COCs detected above their chemical-specific RAOs would be excavated and transported to an onsite location for consolidation and disposal. Confirmation samples would be collected to verify that the site achieves RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Excavation and Offsite Disposal alternative would remove soil containing TPH measured as diesel and PAHs and therefore, would be protective of the environment in the short-term and long-term.

Under this alternative, potential ecological risks would not exist for pickleweed and amphipods because soil containing concentrations TPH measured as diesel and PAHs detected above chemical-specific RAOs would be removed to meet RAOs.

Operations associated with the excavations would introduce some potential short-term human health risks due to the potential for direct contact or inhalation of the contaminants by workers during excavation activities. However, these risks can be controlled and minimized through proper health and safety procedures.

Compliance with Applicable or Relevant and Appropriate Requirements. The Excavation and Onsite Disposal alternative is expected to satisfy chemical-specific TBC criteria and location- and action-specific ARARs. The action-specific ARARs would be achieved through implementation of appropriate procedures, management practices, dust suppression, and air monitoring during remedial activities. In conjunction with the onsite disposal option, excavated soil would be characterized prior to transport to the onsite consolidation area for disposal. All excavated soil would be managed, handled, and characterized using an approved plan prior to transporting and consolidating onsite.

Long-Term Effectiveness and Permanence. The Excavation and Onsite Disposal alternative is expected to be effective in the long-term because the soil containing TPH measured as diesel and PAHs would be physically removed from the site. This would immediately reduce the site risk. Removal of soil containing COCs would be confirmed with confirmation samples. Excavation would provide the greatest degree of effectiveness and permanence at the site because the soil containing the COCs would be removed from the site. However, the soil would be disposed at an approved onsite consolidation/disposal location; therefore, the contaminants would remain on the BRAC Property.

At the onsite Class II consolidation landfill, post-closure care of the engineered cap would be performed in accordance with appropriate regulations as long as groundwater and/or soil vapor monitoring are in effect. The effectiveness of the landfill cap would be determined through water quality, soil gas, and leachate collection. Monitoring would continue for a minimum of 5 years. At the end of every 5-year period (up to year 30) an

evaluation would be performed to determine if a change in monitoring frequency would be appropriate.

Reduction of Toxicity, Mobility, or Volume. The Excavation and Onsite Disposal alternative would reduce mobility at the Building 41 Area because the soil containing the COCs would be removed from the site and disposed at an approved onsite location. Excavation would achieve the RAOs and reduce the site risks. However, soil containing the COCs would remain on the BRAC Property. There would not be a reduction, but rather a transfer of toxicity and volume from the Building 41 Area to the onsite consolidation site. The engineered cap would reduce infiltration of precipitation and potential contaminant migration. Landfill gases (if present) would be passively vented above the breathing zone.

Short-Term Effectiveness. Excavation would achieve the RAOs at the completion of the removal and disposal activities. There is a potential for release of fugitive dusts during the remedial action activities; however, this would be mitigated by developing and implementing appropriate health and safety procedures. Additionally, there may be short-term risks to the public and/or workers during excavation activities through exposure, handling, and transport of soil.

Implementability. The Excavation and Onsite Disposal technology is well established and is technically and administratively implementable. This alternative may encounter opposition to obtaining a permit for installation of a Class II landfill on the BRAC Property. The excavated materials are expected to be nonhazardous, but would be considered designated waste and would require Class II management. Additionally, the presence of site-specific obstacles, such as the Perimeter Levee, asphalt and concrete, a power pole, the PDD, and Building 41 may complicate excavation and removal activities.

At the onsite consolidation site, a Class II non-municipal solid waste landfill would have to be designed, permitted, and installed prior to excavating and transporting site soil from the Inboard Area site for disposal. Following consolidation of all the onsite excavated soil, the landfill would required the installation of an engineered cap for closure.

Cost. Cost estimates are provided in Appendix C. These costs are order-of-magnitude level estimates consistent with EPA requirements for a feasibility study for which cost estimates have an accuracy of plus 50 percent to minus 30 percent. The estimated cost for the excavation and onsite disposal alternative is $25,024. This does not include the cost for construction and capping of the consolidation site.

The cost estimates have been prepared from the best available data at the time of the estimate for guidance in project evaluation and implementation. The final cost of the project would depend on the actual labor and material costs, actual site conditions, final project scope and design, productivity, competitive market conditions, final project schedule, and other variable factors. As a result, the final project costs may vary from those presented in this FFS.

Building 82/87/92/94 Area and Building 86

The following presents the detailed evaluation for the No Further Action, Institutional Control, Excavation with Offsite Disposal, and Excavation with Onsite Disposal remedial alternatives for the Building 82/87/92/94 Area and Building 86. These areas were combined

for the purposes of this evaluation due to their close proximity and general process history. Metals (barium and beryllium) were the COCs identified in the soil at the Building 82/87/92/94 Area which would pose a potential risk to ecological receptors if the receptors were exposed to these COCs during the development and maturation of the wetland. Metals (beryllium, cadmium, chromium, and lead) and PAHs were the COCs identified in the soil at Building 86 which would pose a potential risk to human and ecological receptors if the receptors were exposed to these COCs during the development and maturation of the wetland. Figure B-6 identifies the areas where remedial action is proposed (i.e., the areas where residual concentrations of COCs are above chemical-specific RAOs) at the Building 82/87/92/94 Area and Building 86.

Alternative 1 – No Further Action

Description

Alternative 1 is No Further Action. No actions would be initiated to control potential site-related risks.

Assessment

Overall Protection of Human Health and the Environment. The No Further Action alternative would not be protective of human health and the environment in the short- or long-term. Although residual COCs are currently located at depths ranging from 0.5 to 11.5 feet bgs, under this alternative potential risks to human health and the environment would exist. The potential risk would exist because throughout the development and maturation of the wetland the potential for erosion or excavation would not be controlled and the presence of cover would not be monitored. Potential ecological risks would exist for amphipods, pickleweed, salt marsh harvest mouse, black rail, algae, and mosquitofish because exposure to metals and PAHs (amphipod and pickleweed only) would not be mitigated. Similarly, potential human health risk would also exist at Building 86 from exposure (marsh recreational scenario) to PAHs (i.e. benz(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene). No additional threats would be introduced by this alternative.

Compliance with Applicable or Relevant and Appropriate Requirements. The No Further Action alternative does not achieve the chemical-specific TBC criteria. The COCs would remain in place, and exposure would not be controlled or monitored. Since action is not proposed, there are no action-specific or location-specific ARARs identified for this alternative.

Long-Term Effectiveness and Permanence. The No Further Action alternative is not expected to be effective in the long-term because no remedial actions are proposed. Potential human health and ecological risks have been identified because COCs would remain in place. Potential exposure to COCs would not be controlled or monitored.

Reduction of Toxicity, Mobility, or Volume. The No Further Action alternative does not include any treatment to reduce toxicity, mobility, or volume. Current estimates suggest that approximately 4,103 yd^3 of soil containing metals and PAHs would remain in place.

Short-Term Effectiveness. No remedial actions are proposed; therefore, the RAOs would not be achieved. Since no remedial actions are proposed, there would not be any short-term risks to the public, worker, and/or environment.

Implementability. The No Further Action alternative would not have implementation obstacles because remedial actions are not proposed. Implementation of this alternative does not introduce additional risks.

Cost. No costs would be associated with implementing the No Further Action alternative.

Alternative 2 – Institutional Controls

Description

Alternative 2 is Institutional Controls. The goal of this alternative is to protect human health and the environment by eliminating the exposure pathway between residual COCs and future wetland receptors. The institutional controls would detail performance criteria specifying that the final design for the wetland must restrict excavation and erosion and monitor the depth of cover in areas where COCs are detected above their chemical-specific RAOs. The final design must maintain at least 3 feet of cover in the areas where COCs are detected above chemical-specific RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Institutional Controls alternative would be protective of human health and the environment in the short- and long-term. The COCs are currently located at depths ranging from 0.5 to 11.5 feet bgs. The institutional control alternative would detail performance criteria that specify the final design for the wetland must restrict excavation and erosion, and monitor the depth of cover in areas where COCs are detected above chemical-specific RAOs. The final design must maintain at least 3 feet of cover in the areas where COCs were detected above chemical specific RAOs.

Under this alternative, potential ecological risks would not exist for amphipods, pickleweed, salt marsh harvest mouse, black rail, algae, or mosquitofish because exposure to metals and PAHs (amphipod and pickleweed only) would be eliminated through implementation of the wetland final design performance criteria (monitoring of cover and protection against erosion and/or excavation). Similarly, potential human health risks would not exist at Building 86 because exposure (marsh recreation) to PAHs would be controlled and monitored. No additional threats would be introduced by this alternative.

Compliance with Applicable or Relevant and Appropriate Requirements. The performance criteria specified for the Institutional Controls alternative will meet chemical-specific TBC criteria when 3 feet of stable cover cannot be provided. The alternative would prevent and monitor exposure of receptors to concentrations of metals and PAHs detected above their chemical-specific RAOs. There are no action- or location-specific ARARs identified for this alternative.

Long-Term Effectiveness and Permanence. The Institutional Controls alternative is expected to be effective in the long-term through the use of proprietary and governmental controls. The performance criteria specified in the wetland final design would ensure implementation of restrictions on excavation and/or erosion and monitoring of the level of cover throughout the development and maturation of the wetland.

Reduction of Toxicity, Mobility, or Volume. The Institutional Controls alternative does not include any treatment to reduce toxicity, mobility, or volume. Current estimates suggest

approximately 4,103 yd^3 of soil containing metals and PAHs would remain in place. However, performance criteria for monitoring of cover and prevention of erosion or excavation of cover at the site would eliminate exposure to concentrations of metals and PAHs detected above their chemical-specific RAOs.

Short-Term Effectiveness. The RAO to prevent exposure of amphipods, pickleweed, salt marsh harvest mouse, black rail, algae, and mosquitofish to metals and PAHs and human receptors to PAHs would be achieved by maintaining at least 3 feet of cover in the areas where concentrations of COCs are detected above chemical specific RAOs (see Figure B-6). Potential risks to workers can be controlled and minimized through proper health and safety procedures.

Implementability. The Institutional Controls alternative would have minimal implementation obstacles because the controls would be fully considered and incorporated in preparation of the final wetland design. The performance criteria and monitoring requirements are easily implementable. Enforcement and verification of the recommendations should be a priority.

Cost. Placement of cover and monitoring of the physical development of the wetland are necessary components of the wetland restoration program regardless of the need for remedial action. The performance criteria are designed to provide flexibility in the development and selection of final design and are expected to have only a minor impact on design details. Accordingly, there is no significant incremental cost associated with this alternative.

Alternative 3 – Excavation with Offsite Disposal

Description

Alternative 3 is Excavation with Offsite Disposal remedial alternative. Actions to control site-related risks would consist of conducting a pre-design investigation that would include installation of soil borings to determine the excavation geometry. Following the pre-design investigation, soil concentrations of COCs above chemical-specific RAOs would be excavated, transported, and disposed at an approved offsite landfill. Confirmation samples would be collected to verify that the site achieves RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Excavation and Offsite Disposal alternative would remove soil containing metals and PAHs and therefore, would be protective of the environment in the short-term and long-term.

Under this alternative, potential ecological risks would not exist for amphipods, pickleweed, salt marsh harvest mouse, black rail, algae, or mosquitofish because soil containing concentrations metals and PAHs detected above chemical-specific RAOs would be removed to meet RAOs. Similarly, potential human health risk (ILCR greater than $1x10^{-6}$) would not exist because exposure (marsh recreational scenario) to soil containing PAHs would be removed to meet the RAOs.

Operations associated with the excavations would introduce some potential short-term human health risks due to the potential for direct contact or inhalation of the contaminants

by workers during excavation activities. However, these risks can be controlled and minimized through proper health and safety procedures.

Compliance with Applicable or Relevant and Appropriate Requirements. The Excavation and Offsite Disposal alternative is expected to satisfy chemical-specific TBC criteria and location- and action-specific ARARs. The action-specific ARARs would be achieved through implementation of appropriate procedures, management practices, dust suppression, and air monitoring during remedial activities. In conjunction with the offsite disposal option, excavated soil would be characterized and compared to land ban restrictions prior to transport and disposal. All excavated soil would be managed, handled, and characterized using an approved plan prior to transporting offsite.

Long-Term Effectiveness and Permanence. The Excavation and Offsite Disposal alternative is expected to be effective in the long-term because soil containing metals and PAHs would be physically removed from the site. This would immediately reduce the site risks and achieve RAOs. Removal of the soil would be confirmed with confirmation samples. Excavation would provide the greatest degree of effectiveness and permanence because the concentrations of metals and PAHs detected above chemical-specific RAOs would be removed from the site and disposed of at an appropriate offsite facility.

Reduction of Toxicity, Mobility, or Volume. The Excavation and Offsite Disposal alternative would provide a high degree of mobility reduction because the soil containing metals and PAHs would be removed from the site. Excavation would achieve RAOs. Although the soil would be disposed at an offsite facility, toxicity and volume would not be reduced since no treatment of the soil is proposed.

Short-Term Effectiveness. Excavation would achieve the RAOs at the completion of the removal and disposal activities. There is a potential for release of fugitive dusts during the remedial action activities; however, this would be mitigated by developing and implementing appropriate health and safety procedures. Additionally, there may be short-term risks to the public and/or workers during excavation activities through exposure, handling, and transport of the contaminated materials.

Implementability. The Excavation and Offsite Disposal alternative technology is well established and is technically and administratively implementable. However, the presence of site-specific obstacles, such as the NHP Levee, buildings, and asphalt pavement, may complicate excavation and removal activities. There are no other site-specific obstacles that complicate excavation and removal activities.

Cost. Cost estimates are provided in Appendix C. These costs are order-of-magnitude level estimates consistent with EPA requirements for a feasibility for which the cost estimates have an accuracy of plus 50 percent to minus 30 percent. The estimated cost for the excavation and offsite disposal alternative is $1,298,674.

The cost estimates have been prepared from the best available data at the time of the estimate for guidance in project evaluation and implementation. The final cost of the project would depend on the actual labor and material costs, actual site conditions, final project scope and design, productivity, competitive market conditions, final project schedule, and other variable factors. As a result, the final project costs may vary from those presented in this FFS.

Alternative 4 – Excavation with Onsite Disposal

Description

Alternative 4 is Excavation with Onsite Disposal. Actions to control site-related risks would consist of conducting a pre-design investigation that would include installation of soil borings to determine the excavation geometry. Following the pre-design investigation, soil containing COCs detected above their chemical-specific RAOs would be excavated and transported to an onsite location for consolidation and disposal. Confirmation samples would be collected to verify that the site achieves RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Excavation and Offsite Disposal alternative would remove soil containing metals and PAHs and therefore, would be protective of the environment in the short-term and long-term.

Under this alternative, potential ecological risks would not exist for amphipods, pickleweed, salt marsh harvest mouse, black rail, algae, or mosquitofish because soil containing concentrations of metals and PAHs detected above chemical-specific RAOs would be removed to meet RAOs. Similarly, potential human health risk (ILCR greater than $1x10^{-6}$) would not exist because exposure (marsh recreational scenario) to soil containing PAHs would be removed to meet the RAOs.

Operations associated with the excavations would introduce some potential short-term human health risks due to the potential for direct contact or inhalation of the contaminants by workers during excavation activities. However, these risks can be controlled and minimized through proper health and safety procedures.

Compliance with Applicable or Relevant and Appropriate Requirements. The Excavation and Onsite Disposal alternative is expected to satisfy chemical-specific TBC criteria and location- and action-specific ARARs. The action-specific ARARs would be achieved through implementation of appropriate procedures, management practices, dust suppression, and air monitoring during remedial activities. In conjunction with the onsite disposal option, excavated soil would be characterized prior to transport to the onsite consolidation area for disposal. All excavated soil would be managed, handled, and characterized using an approved plan prior to transporting and consolidating onsite.

Long-Term Effectiveness and Permanence. The Excavation and Onsite Disposal alternative is expected to be effective in the long-term because the soil containing metals and PAHs would be physically removed from the site. This would immediately reduce the site risks. Removal of contaminated soil would be confirmed with confirmation samples. Excavation would provide the greatest degree of effectiveness and permanence at the site because the soil containing the COC would be removed from the site. However, the soil would be disposed of at an approved onsite consolidation/disposal location; therefore, the contaminants would remain on the BRAC Property.

At the onsite Class II consolidation landfill, post-closure care of the engineered cap would be performed in accordance with appropriate regulations as long as groundwater and/or soil vapor monitoring are in effect. The effectiveness of the landfill cap would be determined through water quality, soil gas, and leachate collection. Monitoring would continue for a minimum of 5 years. At the end of every 5-year period (up to year 30) an

evaluation would be performed to determine if a change in monitoring frequency would be appropriate.

Reduction of Toxicity, Mobility, or Volume. The Excavation and Onsite Disposal alternative would reduce mobility at the Building 82/87/92/94 Area and Building 86 Inboard Area sites because the soil containing the COCs would be removed from the site and disposed of at an approved onsite location. Excavation would achieve the RAOs and reduce the site risks. However, soil containing the COCs would remain on the BRAC Property. There would not be a reduction, but rather a transfer of toxicity and volume from the Building 82/87/92/94 Area and Building 86 Inboard Area sites to the onsite consolidation site. The engineered cap would reduce infiltration of precipitation and potential contaminant migration. Landfill gases (if present) would be passively vented above the breathing zone.

Short-Term Effectiveness. Excavation would achieve the RAOs at the completion of the removal and disposal activities. There is a potential for release of fugitive dusts during the remedial action activities; however, this would be mitigated by developing and implementing appropriate health and safety procedures. Additionally, there may be short-term risks to the public and/or workers during excavation activities through exposure, handling, and transport of soil.

Implementability. The Excavation and Onsite Disposal technology is well established and is technically and administratively implementable. This alternative may encounter opposition to obtain a permit for installation of a Class II landfill on the BRAC Property. The excavated materials are expected to be nonhazardous, but would be considered designated waste and would require Class II management. The presence of site-specific obstacles, such as the NHP Levee, buildings, and asphalt pavement, may complicate excavation and removal activities.

At the Onsite consolidation site, a Class II non-municipal solid waste landfill would have to be designed, permitted, and installed prior to excavating and transporting site soil from the Inboard Area sites for disposal. Following consolidation of all the onsite excavated soil, the landfill would require the installation of an engineered cap for closure.

Cost. Cost estimates are provided in Appendix C. These costs are order-of-magnitude level estimates consistent with EPA requirements for a feasibility study for which cost estimates have an accuracy of plus 50 percent to minus 30 percent. The estimated cost for the excavation and onsite disposal alternative is $68,254. This does not include the cost for construction and capping of the consolidation site.

The cost estimates have been prepared from the best available data at the time of the estimate for guidance in project evaluation and implementation. The final cost of the project would depend on the actual labor and material costs, actual site conditions, final project scope and design, productivity, competitive market conditions, final project schedule, and other variable factors. As a result, the final project costs may vary from those presented in this FFS.

Perimeter Drainage Ditch

The following presents the detailed evaluation for the No Further Action, Institutional Control, Excavation with Offsite Disposal, and Excavation with Onsite Disposal remedial alternatives for the PDD. Beryllium and pesticides (DDD, DDE, DDT, and dieldrin) were the

COCs identified in the soil which would pose a potential risk to ecological and human health receptors if these receptors were exposed to these COCs during the development and maturation of the wetland. Figures B-8a and B-8b identify the areas where remedial action is proposed (i.e., the areas where residual concentrations of COCs are above their chemical-specific RAOs) at the PDD.

Alternative 1 – No Further Action

Description

Alternative 1 is No Further Action. No actions would be initiated to control potential site-related risks.

Assessment

Overall Protection of Human Health and the Environment. The No Further Action alternative would not be protective of human health and the environment in the short- or long-term. Although residual COCs are currently located at depths ranging from 1 to 1.5 feet bgs, under this alternative potential risks to human health and the environment would exist. The potential risk would exist because: a minimum of 3 feet of cover is not provided, the potential for erosion or excavation would not be controlled, and the presence of cover would not be monitored. Potential ecological risks would exist for amphipods, black rail, snipe, bay shrimp, algae, sediment invertebrate, and mosquitofish because exposure to beryllium (amphipod, sediment invertebrate, algae, and mosquito fish only) and pesticides in soil would not be controlled or mitigated. Similarly, potential human health risk (ILCR greater than $1x10^{-6}$) would exist from ingestion of fish (recreational fishing scenario) containing dieldrin. No additional threats would be introduced by this alternative.

Compliance with Applicable or Relevant and Appropriate Requirements. The No Further Action alternative does not achieve the chemical-specific TBC criteria. The COCs would remain in place, and exposure would not be controlled or monitored. Since action is not proposed, there are no action- or location-specific ARARs identified for this alternative.

Long-Term Effectiveness and Permanence. The No Further Action alternative is not expected to be effective in the long-term because no remedial actions are proposed. Potential human health and ecological risks have been identified because COCs would remain in place. Potential exposure to COCs would not be controlled or monitored.

Reduction of Toxicity, Mobility, or Volume. The No Further Action alternative does not include any treatment to reduce toxicity, mobility, or volume. Current estimates suggest that approximately 14,296 yd^3 of soil containing pesticides and beryllium would remain in place.

Short-Term Effectiveness. No remedial actions are proposed; therefore, the RAOs would not be achieved. Since no remedial actions are proposed, there would not be any short-term risks to the public, worker, and/or environment.

Implementability. The No Further Action alternative would not have implementation obstacles because remedial actions are not proposed. Implementation of this alternative does not introduce additional risks.

Cost. No costs would be associated with implementing the No Further Action alternative.

Alternative 2 – Institutional Controls

Description

Alternative 2 is Institutional Controls. The goal of this alternative is to protect human health and the environment by eliminating the exposure pathway between residual COCs and future wetland receptors. The institutional controls would detail performance criteria specifying that the final design for the wetland must restrict excavation and erosion and monitor the depth of cover in areas where COCs are detected above chemical-specific RAOs. The final design must maintain at least 3 feet of cover in the areas where COCs are detected above chemical-specific RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Institutional Controls alternative would be protective of human health and the environment in the short-term and long-term. COCs are currently located at depths ranging from 1 to 1.5 feet bgs. The PDD will be backfilled during wetland construction, therefore, the institutional control alternative would detail performance criteria specifying that the final design for the wetland must: provide a minimum of 3 feet of cover, restrict excavation and erosion, and monitor the depth of cover in the areas where COCs were detected above chemical-specific RAOs.

Under this alternative, potential ecological risks would not exist for amphipods, black rail, snipe, bay shrimp, algae, sediment invertebrate, and mosquitofish because exposure to beryllium (amphipod, sediment invertebrate, algae, and mosquito fish only) and pesticides would be eliminated through implementation of the wetland final design performance criteria (providing cover, monitoring of cover, and protection against erosion and/or excavation). Similarly, potential human health risks would not exist from ingestion of fish (recreational fishing scenario) because potential fish exposure to dieldrin would be controlled and monitored. No additional threats would be introduced by this alternative.

Compliance with Applicable or Relevant and Appropriate Requirements. The performance criteria specified for the Institutional Controls alternative will meet chemical-specific TBC criteria when 3 feet of stable cover cannot be provided. The alternative would prevent and monitor exposure of receptors to concentrations of COCs detected above chemical-specific RAOs. There are no action- or location-specific ARARs identified for this alternative.

Long-Term Effectiveness and Permanence. The Institutional Controls alternative is expected to be effective in the long-term through the use of proprietary and governmental controls. The performance criteria specified in the wetland final design would ensure a minimum of 3 feet of cover would be provided, and would implement restriction on excavation and/or erosion and monitoring of the level of cover throughout the development and maturation of the wetland.

Reduction of Toxicity, Mobility, or Volume. The Institutional Controls alternative does not include any treatment to reduce toxicity, mobility, or volume. Current estimates suggest that approximately 14,296 yd^3 of soil containing beryllium and pesticides would remain in place. However, performance criteria for applying cover, monitoring cover, and prevention of erosion or excavation of cover at the site would eliminate exposure to concentrations of beryllium and pesticides detected above chemical-specific RAOs.

Short-Term Effectiveness. The RAOs to prevent exposure of amphipods, black rail, snipe, bay shrimp, algae, sediment invertebrates, and mosquitofish to beryllium and pesticides and human ingestion of fish contaminated by dieldrin would be achieved by maintaining at least 3 feet of cover in areas where concentrations of COCs are detected above chemical-specific RAOs (see Figures B-8a and B-8b). Potential risks to workers can be controlled and minimized through proper health and safety procedures.

Implementability. The Institutional Controls alternative would have minimal implementation obstacles because the controls would be fully considered and incorporated in preparation of the final wetland design. The performance criteria and monitoring requirements are easily implementable. Enforcement and verification of the recommendations should be a priority.

Cost. Placement of cover and monitoring of the physical development of the wetland are necessary components of the wetland restoration program regardless of the need for remedial action. The performance criteria are designed to provide flexibility in the development and selection of final design and are expected to have only a minor impact on design details. Accordingly, there is no significant incremental cost associated with this alternative.

Alternative 3 – Excavation with Offsite Disposal

Description

Alternative 3 is Excavation with Offsite Disposal remedial alternative. Actions to control site-related risks would consist of conducting a pre-design investigation that would include installation of soil borings to determine the excavation geometry. Following the pre-design investigation, soil concentrations of COCs above chemical-specific RAOs would be excavated, transported, and disposed at an approved offsite landfill. Confirmation samples would be collected to verify that the site achieves RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Excavation and Offsite Disposal alternative would remove soil containing beryllium and pesticides and therefore, would be protective of the environment in the short- and long-term.

Under this alternative, potential ecological risks would not exist for amphipods, black rail, snipe, bay shrimp, sediment invertebrate, and mosquitofish because soil containing concentrations of beryllium and pesticides detected above their chemical-specific RAOs would be removed to meet RAOs. Similarly, potential human health risk (ILCR greater than $1x10^{-6}$) would not exist from ingestion of fish (recreational fishing scenario) because the potential for fish exposure to pesticides would be eliminated.

Operations associated with the excavations would introduce some potential short-term human health risks due to the potential for direct contact or inhalation of the contaminants by workers during excavation activities. However, these risks can be controlled and minimized through proper health and safety procedures.

Compliance with Applicable or Relevant and Appropriate Requirements. The Excavation and Offsite Disposal alternative is expected to satisfy chemical-specific TBC criteria and location- and action-specific ARARs. The action-specific ARARs would be achieved through

implementation of appropriate procedures, management practices, dust suppression, and air monitoring during remedial activities. In conjunction with the offsite disposal option, excavated soil would be characterized and compared to land ban restrictions prior to transport and disposal. All excavated soil would be managed, handled, and characterized using an approved plan prior to transporting offsite.

Long-Term Effectiveness and Permanence. The Excavation and Offsite Disposal alternative is expected to be effective in the long-term because soil containing COCs would be physically removed from the site. This would immediately reduce the site risks and achieve RAOs. Removal of the soil would be confirmed with confirmation samples. Excavation would provide the greatest degree of effectiveness and permanence because the concentrations COCs requiring further action would be removed from the site and disposed of at an appropriate offsite facility.

Reduction of Toxicity, Mobility, or Volume. The Excavation and Offsite Disposal alternative would provide a high degree of mobility reduction because the soil containing COCs would be removed from the site. Excavation would achieve RAOs. Although the soil would be disposed of at an offsite facility, toxicity and volume would not be reduced since no treatment of the soil is proposed.

Short-Term Effectiveness. Excavation would achieve the RAOs at the completion of the removal and disposal activities. There is a potential for release of fugitive dusts during the remedial action activities; however, this would be mitigated by developing and implementing appropriate health and safety procedures. Additionally, there may be short-term risks to the public and/or workers during excavation activities through exposure, handling, and transport of the contaminated materials.

Implementability. The Excavation and Offsite Disposal alternative technology is well established and is technically and administratively implementable. However, the presence of water in the ditch and the moisture of the excavated sediment may complicate excavation, removal, and disposal activities.

Prior to removal of the sediments, specified lengths of the channel would need to be dewatered through pumping or installation of diversion or coffer dams. After removal of the sediments, the excavated material may need to be dried or blended with dry soil prior to disposal, to meet landfill acceptance criteria of moisture content.

Cost. Cost estimates are provided in Appendix C. These costs are order-of-magnitude level estimates consistent with the EPA requirements for a feasibility study that the cost estimates have an accuracy of plus 50 percent to minus 30 percent. The estimated cost for the excavation and offsite disposal alternative is $4,502,006.

The cost estimates have been prepared for guidance in project evaluation and implementation from the best available data at the time of the estimate. The final cost of the project would depend on the actual labor and material costs, actual site conditions, final project scope and design, productivity, competitive market conditions, final project schedule, and other variable factors. As a result, the final project costs may vary from those presented in this FFS.

Alternative 4 – Excavation with Onsite Disposal

Description

Alternative 4 is Excavation with Onsite Disposal. Actions to control site-related risks would consist of conducting a pre-design investigation that would include installation of soil borings to determine the excavation geometry. Following the pre-design investigation, soil containing COCs detected above chemical-specific RAOs would be excavated and transported to an onsite location for consolidation and disposal. Confirmation samples would be collected to verify that the site achieves RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Excavation and Offsite Disposal alternative would remove soil containing beryllium and pesticides and therefore would be protective of the environment in the short- and long-term.

Under this alternative, potential ecological risks would not exist for amphipods, black rail, snipe, bay shrimp, sediment invertebrate, and mosquitofish because soil containing concentrations of beryllium and pesticides detected above chemical-specific RAOs would be removed to meet RAOs. Similarly, potential human health risk (ILCR greater than $1x10^{-6}$) would not exist from ingestion of fish (recreational fishing scenario) because the potential for fish exposure to pesticides would be eliminated.

Operations associated with the excavations would introduce some potential short-term human health risks due to the potential for direct contact or inhalation of the contaminants by workers during excavation activities. However, these risks can be controlled and minimized through proper health and safety procedures.

Compliance with Applicable or Relevant and Appropriate Requirements. The Excavation and Onsite Disposal alternative is expected to satisfy chemical-specific TBC criteria and location- and action-specific ARARs. The action-specific ARARs would be achieved through implementation of appropriate procedures, management practices, dust suppression, and air monitoring during remedial activities. In conjunction with the onsite disposal option, excavated soil would be characterized prior to transport to the onsite consolidation area for disposal. All excavated soil would be managed, handled, and characterized using an approved plan prior to transporting and consolidating onsite.

Long-Term Effectiveness and Permanence. The Excavation and Onsite Disposal alternative is expected to be effective in the long-term because the soil containing beryllium and pesticides would be physically removed from the site. This would immediately reduce the site risk. Removal of impacted soil would be confirmed with confirmation samples. Excavation would provide the greatest degree of effectiveness and permanence at the site because the soil containing the COCs would be removed from the site. However, the soil would be disposed at an approved onsite consolidation/disposal location; therefore, the contaminants would remain on the BRAC Property.

At the onsite Class II consolidation landfill, post-closure care of the engineered cap would be performed in accordance with appropriate regulations as long as groundwater and/or soil vapor monitoring are in effect. The effectiveness of the landfill cap would be determined through water quality, soil gas, and leachate collection. Monitoring would continue for a minimum of 5 years. At the end of every 5-year period (up to year 30) an

evaluation would be performed to determine if a change in monitoring frequency would be appropriate.

Reduction of Toxicity, Mobility, or Volume. The Excavation and Onsite Disposal alternative would reduce mobility at PDD because the soil containing the COCs would be removed from the site and disposed at an approved onsite location. Excavation would achieve the RAOs and reduce the site risks. However, soil containing the COCs would remain on the BRAC Property. There would not be a reduction, but rather a transfer of toxicity and volume from the PDD to the onsite consolidation site. The engineered cap would reduce infiltration of precipitation and potential contaminant migration. Landfill gases (if present) would be passively vented above the breathing zone.

Short-Term Effectiveness. Excavation would achieve the RAOs at the completion of the removal and disposal activities. There is a potential for release of fugitive dusts during the remedial action activities; however, this would be mitigated by developing and implementing appropriate health and safety procedures. Additionally, there may be short-term risks to the public and/or workers during excavation activities through exposure, handling, and transport of soil.

Implementability. The Excavation and Onsite Disposal technology is well established and is implementable both technically and administratively. This alternative may encounter opposition to obtain a permitting for installation of a Class II landfill on the BRAC Property. The excavated materials are expected to be nonhazardous, but would be considered designated waste and would require Class II management. The presence of water in the ditch and the moisture of the excavated sediments may complicate excavation, removal, and disposal activities. Prior to removal of the sediments, specified lengths of the channel would need to be dewatered through pumping or installation of diversion or coffer dams. After removal of the sediments, the excavated material may need to be dried or blended with dry soil prior to disposal, to meet landfill acceptance criteria of moisture content.

At the Onsite consolidation site, a Class II non-municipal solid waste landfill would have to be designed, permitted, and installed prior to excavating and transporting site soil from the Inboard Area sites for disposal. Following consolidation of all the onsite excavated soil, the landfill would require the installation of an engineered cap for closure.

Cost. Cost estimates are provided in Appendix C. These costs are order-of-magnitude level estimates consistent with EPA requirements for a feasibility study for which cost estimates have an accuracy of plus 50 percent to minus 30 percent. The estimated cost for the excavation and onsite disposal alternative is $214,879. This does not include the cost for construction and capping of the consolidation site.

The cost estimates have been prepared from the best available data at the time of the estimate for guidance in project evaluation and implementation. The final cost of the project would depend on the actual labor and material costs, actual site conditions, final project scope and design, productivity, competitive market conditions, final project schedule, and other variable factors. As a result, the final project costs may vary from those presented in this FFS.

Perimeter Drainage Ditch Spoils Piles (A, B, D, E, F, G, I, J, K, L, M and N)

The following presents the detailed evaluation for the No Further Action, Institutional Control, Excavation with Offsite Disposal, and Excavation with Onsite Disposal remedial alternatives for PDD Spoils Piles A, B, D, E, F, G, I, J, K, L, M and N. The following COCs were identified for each spoils pile:

- Spoils Pile A – Beryllium, zinc, DDE, and DDT
- Spoils Pile B – Cadmium, copper, mercury, silver, zinc, DDE, and DDT
- Spoils Pile D – DDE and DDT
- Spoils Pile E – DDE and DDT
- Spoils Pile F – Dibenzofuran, DDD, DDE, and DDT 8 Metals, and 12 PAHs,
- Spoils Pile G – DDE and DDT
- Spoils Pile I – Beryllium, DDE, and DDT
- Spoils Pile J – DDD, DDE, and DDT
- Spoils Pile K – DDE and DDT
- Spoils Pile L – Barium, cobalt, lead, zinc, and DDT
- Spoils Pile M – DDE and DDT
- Spoils Pile N – Lead, DDE, and DDT

The COCs identified in the soil at the PDD spoils piles would pose a potential risk to ecological receptors if these receptors were exposed to COCs during development and maturation of the wetland. The COCs identified at Spoils Pile F would also pose a potential risk to human receptors if these receptors were exposed to COCs during the development and maturation of the wetland. Figures B-9 and B-10 identifies the areas where remedial action is proposed (i.e., the area where residual concentrations of COCs are detected above their chemical-specific RAOs) at the PDD spoils piles.

Alternative 1 – No Further Action

Description

Alternative 1 is No Further Action. No actions would be initiated to control potential site-related risks.

Assessment

Overall Protection of Human Health and the Environment.

The No Further Action alternative would not be protective of human health and the environment in the short- or long-term. Although residual COCs are currently located at depths ranging from zero to 1 foot bgs, potential risks to human health and the environment would exist. The potential risk would exist because: a minimum of 3 feet of cover is not provided, the potential for erosion or excavation would not be controlled, and the presence of cover would not be monitored. Under this alternative, potential ecological risks would

exist for the following receptors because exposure to COCs would not be controlled or mitigated:

Spoils Pile A – Exposure of pickleweed and amphipods to soil containing zinc and pesticides (amphipod only). Exposure of sediment invertebrate to water containing pesticides, and algae to water containing beryllium.

Spoils Pile B – Exposure of salt marsh harvest mouse, pickleweed, amphipods, black rail, bay shrimp, and algae to soil containing metals. Exposure of algae and sediment invertebrate to water containing copper.

Spoils Pile D – Exposure of amphipods to soil containing DDE and DDT. Exposure of sediment invertebrate to water containing DDE and DDT.

Spoils Piles E, K and M – Exposure of amphipods to soil containing DDE and DDT.

Spoils Piles F – Exposure of salt marsh harvest mouse, pickleweed, black rail, algae, and amphipods to soil containing metals and PAHs (pickleweed and amphipods). Exposure of bay shrimp, algae, black rail, and amphipods to pesticides. Exposure of humans to metals and PAHs from marsh recreation.

Spoils Pile G – Exposure of amphipods and black rails to soil containing pesticides.

Spoils Pile I – Exposure of amphipods to soil containing beryllium, DDD, and DDT.

Spoils Pile J – Exposure of amphipod to soil containing DDD, DDE, and DDT.

Spoils Pile L – Exposure of pickleweed and amphipods to soil containing DDD, DDE, and DDT.

Spoils Pile N – Exposure of amphipods and black rail to soil containing pesticides. Exposure of sediment invertebrate to water containing lead and pesticides.

Similarly, potential human health risk (ILCR greater than $1x10^{-6}$) would exist at Spoils Pile F from exposure (marsh recreational scenario) to soil containing benz(a)anthracene, benzo(a)pyrene, and benzo(b)flouranthene. No additional threats would be introduced by this alternative.

Compliance with Applicable or Relevant and Appropriate Requirements. The No Further Action alternative does not achieve the chemical-specific TBC criteria. The COCs would remain in place, and exposure would not be controlled or monitored. Since action is not proposed, there are no action- or location-specific ARARs identified for this alternative.

Long-Term Effectiveness and Permanence. The No Further Action alternative is not expected to be effective in the long-term because no remedial actions are proposed. Potential human health and ecological risks have been identified because COCs would remain in place. Potential exposure to COCs would not be controlled or monitored.

Reduction of Toxicity, Mobility, or Volume. The No Further Action alternative does not include any treatment to reduce toxicity, mobility, or volume. Current estimates suggest that approximately 4,180 yd^3 of soil containing metals, pesticides, PAHs, and dibenzofuran would remain in place.

Short-Term Effectiveness. No remedial actions are proposed; therefore, the RAOs would not be achieved. Since no remedial actions are proposed, there would not be any short-term risks to the public, worker, and/or environment.

Implementability. The No Further Action alternative would not have implementation obstacles because remedial actions are not proposed. Implementation of this alternative does not introduce additional risks.

Cost. No costs would be associated with implementing the No Further Action alternative.

Alternative 2 – Institutional Controls

Description

Alternative 2 is Institutional Controls. The goal of this alternative is to protect human health and the environment by eliminating the exposure pathway between residual COCs and future wetland receptors. The institutional controls would detail performance criteria specifying that the final design for the wetland must restrict excavation and erosion and monitor the depth of cover in areas where COCs are detected above their chemical-specific RAOs. The final design must maintain at least 3 feet of cover in the areas where COCs are detected above chemical-specific RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Institutional Controls alternative would be protective of human health and the environment in the short- and long-term. COCs are currently located at depths ranging from zero to 1 foot bgs. The institutional control alternative would detail performance criteria specifying that the final design for the wetland must: provide a minimum of 3 feet of cover, restrict excavation and erosion, and monitor the depth of cover in the areas where COCs were detected above chemical-specific RAOs.

Under this alternative, potential ecological risks would not exist for ecological receptors because exposure to metals, PAHs dibenzofuran, and pesticides would be eliminated though implementation of the wetland final design criteria (providing cover, monitoring of cover, and protection against erosion and/or excavation). Similarly, potential human health risk would not exist from ingestion of fish (recreational fishing scenarios) because the potential for fish to be exposed to PAHs would be controlled and monitored. No additional threats would be introduced by this alternative.

Spoils Pile A – During the 1998 Interim Removal Actions (IT, 1999b), soil was removed from the footprint of the spoils pile down to the approximate original grade. One confirmation sample was taken at 1 foot bgs. Metals (zinc and beryllium) and total DDTs were detected above their comparator values in the confirmation sample.

Spoils Pile B – This spoils pile was removed to the approximate original grade in 1998. During the 1999 Interim Removal Actions (IT, 2000), the footprint of the spoils pile was excavated to a depth of 1.5 feet bgs (approximately 591 yd^3). Metals (cadmium, mercury, zinc, and sliver) and pesticides were detected above their comparator values in confirmation samples.

Spoils Pile D – The spoils pile was removed to the approximate original grade in 1998. Pesticides (total DDTs) were detected above the comparator value at a depth of 1 foot bgs.

Spoils Pile E – The spoils pile was removed to the approximate original grade in 1998. In 1999, an additional interim removal action was conducted at the site. Pesticides (total DDTs) were detected above chemical-specific ROAs in one sample collected at a depth of 1 foot bgs.

Spoils Pile F – There is no physical evidence to pinpoint the location of spoils pile F. Therefore, risks from Spoils Pile F are hypothetical at this time. The estimated location of the spoils pile is within the designed channel cut; thus all soil would be removed during wetland construction. In 1995, metals, PAHs, and pesticides were detected above chemical-specific RAOs at a depth of 0.5 foot bgs.

Spoils Pile G– The spoils pile was removed to the approximate original grade in 1998. Pesticides (total DDTs) were detected above chemical-special RAOs at a depth of 1 foot bgs.

Spoils Pile I – This spoils pile was removed to the approximate original grade in 1998. During the 1999 Interim Removal Actions (IT, 2000), the footprint of the spoils pile was excavated to a depth of 1.5 feet bgs (approximately 230 yd^3). Beryllium (1.1 mg/kg), was detected at its comparator value (1 mg/kg), and total DDTs were detected above chemical-specific RAOs.

Spoils Pile J – The spoils pile was removed to the approximate original grade in 1998. In 1999, an additional interim removal action was conducted at the site. Pesticides (total DDTs) were detected above chemical-specific RAOs at a depth of 0.5 foot bgs.

Spoils Pile K – The spoils pile was removed to the approximate original grade in 1998. Pesticides (total DDTs) were detected above chemical-specific RAOs at a depth of 1 foot bgs.

Spoils Pile L – This spoils pile was removed to the approximate original grade in 1998. During the 1999 Interim Removal Actions (IT, 2000), the footprint of the spoils pile was excavated to a depth of 1.5 feet bgs (approximately 100 yd^3). The potential ecological risks at this spoils pile were based on the confirmation sample collected from the 1998 excavation. The 1998 confirmation sample point was removed during the 1999 interim removal action. The confirmation sample collected from the 1999 interim removal excavation did not detect analytes above chemical-specific RAOs.

Spoils Pile M – The spoils pile was removed to the approximate original grade in 1998. Pesticides (total DDTs) were detected above chemical-specific RAOs at a depth of 1 foot bgs.

Spoils Pile N – This spoils pile was removed to the approximate original grade in 1998. Three confirmation samples were collected. Pesticides (total DDTs) were detected above chemical-specific RAOs in two samples collected at a depth of 0.5 foot bgs, and lead was detected above chemical-specific RAOs one sample collected at a depth of 0.5 foot bgs.

Compliance with Applicable or Relevant and Appropriate Requirements. The performance criteria specified for the Institutional Controls alternative will meet chemical-specific TBC criteria when 3 feet of stable cover cannot be provided. The alternative would prevent and monitor exposure of receptors to concentrations of COCs detected above chemical-specific RAOs. There are no action- or location-specific ARARs identified for this alternative.

Long-Term Effectiveness and Permanence. The Institutional Controls alternative is expected to be effective in the long-term through the use of proprietary and governmental controls.

The performance criteria specified in the wetland final design would ensure a minimum of 3 feet of cover would be provided and would implement restrictions on excavation and/or erosion and of the level of cover throughout the development and maturation of the wetland.

Reduction of Toxicity, Mobility, or Volume. The Institutional Controls alternative does not include any treatment to reduce toxicity, mobility, or volume. Current estimates suggest that approximately 4,180 yd^3 (for all spoils piles) of soil containing metals, pesticides, PAHs, and dibenzofuran would remain in place. However, performance criteria for applying cover, monitoring cover, and prevention of erosion or excavation of cover at the site would eliminate exposure to concentrations of COCs detected above the chemical-specific RAOs.

Short-Term Effectiveness. The RAOs to prevent exposure of ecological receptors to COCs and human ingestion of fish contaminated by PAHs by maintaining at least 3 feet of cover in areas where concentrations of COCs are detected above chemical-specific RAOs (see Figures B-8 though B-10). The workers would be adequately protected.

Implementability. The Institutional Controls alternative would have minimal implementation obstacles because the controls would be fully considered and incorporated in preparation of the final wetland design. The performance criteria and monitoring requirements are easily implementable. Enforcement and verification of the recommendations should be a priority.

Cost. Placement of cover and monitoring of the physical development of the wetland are necessary components of the wetland restoration program regardless of the need for remedial action. The performance criteria are designed to provide flexibility in the development and selection of final design and are expected to have only a minor impact on design details. Accordingly, there is no significant incremental cost associated with this alternative.

Alternative 3 – Excavation with Offsite Disposal

Description

Alternative 3 is Excavation with Offsite Disposal remedial alternative. Actions to control site-related risks would consist of conducting a pre-design investigation that would include installation of soil borings to determine the excavation geometry. Following the pre-design investigation, soil concentrations of COCs above their chemical-specific RAOs would be excavated, transported, and disposed at an approved off site landfill. Confirmation samples would be collected to verify that the site achieves RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Excavation and Offsite Disposal alternative would remove soil containing the COCs detected at each spoils pile and therefore, would be protective of the environment in the short- and long-term.

Under this alternative, potential ecological risks would not exist for the human and ecological receptors because soil containing concentrations the COCs detected above chemical-specific RAOs at each spoils pile would be removed to meet RAOs.

Operations associated with the excavations would introduce some potential short-term human health risks due to the potential for direct contact or inhalation of the contaminants

by workers during excavation activities. However, these risks can be controlled and minimized through proper health and safety procedures.

Compliance with Applicable or Relevant and Appropriate Requirements. The Excavation and Offsite Disposal alternative is expected to satisfy chemical-specific TBC criteria and location- and action-specific ARARs. The action-specific ARARs would be achieved through implementation of appropriate procedures, management practices, dust suppression, and air monitoring during remedial activities. In conjunction with the offsite disposal option, excavated soil would be characterized and compared to land ban restrictions prior to transport and disposal. All excavated soil would be managed, handled, and characterized using an approved plan prior to transporting offsite.

Long-Term Effectiveness and Permanence. The Excavation and Offsite Disposal alternative is expected to be effective in the long-term because soil containing COCs would be physically removed from each spoils pile. This would immediately reduce the site risks and achieve RAOs. Removal of the soil would be confirmed with confirmation samples. Excavation would provide the greatest degree of effectiveness and permanence because the concentrations COCs requiring further action would be removed from the site and disposed at an appropriate offsite facility.

Reduction of Toxicity, Mobility, or Volume. The Excavation and Offsite Disposal alternative would provide a high degree of mobility reduction because the soil containing COCs would be removed from each spoils pile. Excavation would achieve RAOs. Although the soil would be disposed of at an offsite facility, toxicity and volume would not be reduced since no treatment of the soil is proposed.

Short-Term Effectiveness. Excavation would achieve the RAOs at the completion of the removal and disposal activities. There is a potential for release of fugitive dusts during the remedial action activities; however, this would be mitigated by developing and implementing appropriate health and safety procedures. Additionally, there may be short-term risks to the public and/or workers during excavation activities through exposure, handling, and transport of the contaminated materials.

Implementability. The Excavation and Offsite Disposal alternative technology is well established and is technically and administratively implementable. However, the presence of site-specific obstacles, such as the PDD, may complicate excavation and removal activities. Additionally, the location of Spoils Pile F is not apparent since there is no physical evidence as to its existence. There are no other site-specific obstacles that should complicate excavation an removal activities.

Cost. Cost estimates for the individual spoils piles are provided in Appendix C. These costs are order-of-magnitude level estimates consistent with EPA requirements for a feasibility study for which cost estimates have an accuracy of plus 50 percent to minus 30 percent. The estimated cost for the excavation and offsite disposal alternative for each spoils pile is as follows:

- Spoils Pile A - $55,892
- Spoils Pile B - $123,374
- Spoils Pile D - $60,244
- Spoils Pile E - $56,507

- Spoils Pile F - $182,305
- Spoils Pile G - $68,213
- Spoils Pile I - $41,202
- Spoils Pile J - $16,915
- Spoils Pile K - $32,852
- Spoils Pile L - $9,811
- Spoils Pile M - $126,722
- Spoils Pile N - $72,078.

The cost estimates have been prepared from the best available data at the time of the estimate for guidance in project evaluation and implementation. The final cost of the project would depend on the actual labor and material costs, actual site conditions, final project scope and design, productivity, competitive market conditions, final project schedule, and other variable factors. As a result, the final project costs may vary from those presented in this FFS.

Alternative 4 – Excavation with Onsite Disposal

Description

Alternative 4 is Excavation with Onsite Disposal. Actions to control site-related risks would consist of conducting a pre-design investigation that would include installation of soil borings to determine the excavation geometry. Following the pre-design investigation, soil containing COCs detected above chemical-specific RAOs would be excavated and transported to an onsite location for consolidation and disposal. Confirmation samples would be collected to verify that the site achieves RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Excavation and Offsite Disposal alternative would remove soil containing the COCs detected at each spoils pile and therefore, would be protective of human health and the environment in the short-term and long-term.

Under this alternative, potential ecological risks would not exist for the human and ecological receptors because soil containing concentrations the COCs detected above chemical-specific RAOs at each spoils pile would be removed to meet RAOs.

Operations associated with the excavations would introduce some potential short-term human health risks due to the potential for direct contact or inhalation of the contaminants by workers during excavation activities. However, these risks can be controlled and minimized through proper health and safety procedures.

Compliance with Applicable or Relevant and Appropriate Requirements. The Excavation and Onsite Disposal alternative is expected to satisfy chemical-specific TBC criteria and location- and action-specific ARARs. The action-specific ARARs would be achieved through implementation of appropriate procedures, management practices, dust suppression, and air monitoring during remedial activities. In conjunction with the onsite disposal option, excavated soil would be characterized prior to transport to the onsite consolidation area for disposal. All excavated soil would be managed, handled, and characterized using an approved plan prior to transporting and consolidating onsite.

Long-Term Effectiveness and Permanence. The Excavation and Onsite Disposal alternative is expected to be effective in the long-term because the soil containing the COCs would be physically removed from each spoils pile. This would immediately reduce the site risk. Removal of soil containing COCs would be confirmed with confirmation samples at each spoils pile. Excavation would provide the greatest degree of effectiveness and permanence at the site because the soil containing the COCs would be removed from each spoils pile. However, the soil would be disposed of at an approved onsite consolidation/disposal location; therefore, the contaminants would remain on the BRAC Property.

At the onsite Class II consolidation landfill, post-closure care of the engineered cap would be performed in accordance with appropriate regulations as long as groundwater and/or soil vapor monitoring are in effect. The effectiveness of the landfill cap would be determined through water quality, soil gas, and leachate collection. Monitoring would continue for a minimum of 5 years. At the end of every 5-year period (up to year 30) an evaluation would be performed to determine if a change in monitoring frequency would be appropriate.

Reduction of Toxicity, Mobility, or Volume. The Excavation and Onsite Disposal alternative would reduce mobility at the PDD spoils piles because the soil containing the COCs would be removed from each spoils pile site and disposed of at an approved onsite location. Excavation would achieve the RAOs and reduce the site risks. However, soil containing the COCs would remain on the BRAC Property. There would not be a reduction but rather a transfer of toxicity and volume from the PDD spoils piles to the onsite consolidation site. The engineered cap would reduce infiltration of precipitation and potential contaminant migration. Landfill gases (if present) would be passively vented above the breathing zone.

Short-Term Effectiveness. Excavation would achieve the RAOs at the completion of the removal and disposal activities. There is a potential for release of fugitive dusts during the remedial action activities; however, this would be mitigated by developing and implementing appropriate health and safety procedures. Additionally, there may be short-term risks to the public and/or workers during excavation activities through exposure, handling, and transport of soil.

Implementability. The Excavation and Onsite Disposal technology is well established and is technically and administratively implementable. This alternative may encounter opposition to obtain a permit for installation of a Class II landfill on the BRAC Property. The excavated materials are expected to be nonhazardous, but would be considered designated waste and would require Class II management. The presence of site-specific obstacles, such as the PDD may complicate excavation and removal activities. Additionally, the location of Spoils Pile F is not apparent since there is no physical evidence as to its existence.

Cost. Cost estimates are provided in Appendix C. These costs are order-of-magnitude level estimates consistent with EPA requirements for a feasibility study for which cost estimates have an accuracy of plus 50 percent to minus 30 percent. The estimated cost for the excavation and onsite disposal alternative for each of the spoils piles is as follows:

- Spoils Pile A - $9,350
- Spoils Pile B - $11,817
- Spoils Pile D - $9,144

- Spoils Pile E - $7,697
- Spoils Pile F - $17,729
- Spoils Pile G - $9,436
- Spoils Pile I - $8,814
- Spoils Pile J - $7,559
- Spoils Pile K - $8,142
- Spoils Pile L - $8,611
- Spoils Pile M - $11,806
- Spoils Pile N - $9,942

This does not include the cost for construction and capping of the consolidation site.

The cost estimates have been prepared from the best available data at the time of the estimate for guidance in project evaluation and implementation. The final cost of the project would depend on the actual labor and material costs, actual site conditions, final project scope and design, productivity, competitive market conditions, final project schedule, and other variable factors. As a result, the final project costs may vary from those presented in this FFS.

Onshore Fuel Line – 54-inch Drain Line Segment

The following presents the detailed evaluation for the No Further Action, Institutional Control, Excavation with Offsite Disposal, and Excavation with Onsite Disposal remedial alternatives for the ONSFL–54-inch Drain Line Segment. TPH measured as gasoline is the COC identified in the soil which would pose a potential to ecological receptors if these receptors were exposed to COCs during the development and maturation of the wetland. Figure B-12 identifies the areas where remedial action is proposed (i.e., the areas where residual concentrations of COCs are detected above their chemical-specific RAOs) at the ONSFL-54-inch Drain Line Segment.

Alternative 1 – No Further Action

Description

Alternative 1 is No Further Action. No actions would be initiated to control potential site-related risks.

Assessment

Overall Protection of Human Health and the Environment. The No Further Action alternative would not be protective of the environment in the short-term or long-term. Although the residual COC (TPH measured as gasoline) is currently located at depths ranging from 3 to 11.5 feet bgs, under this alternative potential risks to the environment would exist. The potential risk would exist because throughout the development and maturation of the wetland the potential for erosion or excavation would not be controlled and the presence of cover would not be monitored. Potential ecological risks would exist for amphipods because exposure to TPH measured as gasoline in soil would not be controlled or mitigated. No additional threats would be introduced by this alternative.

Compliance with Applicable or Relevant and Appropriate Requirements. The No Further Action alternative does not achieve the chemical-specific TBC criteria. The COC would remain in place, and exposure would not be controlled or monitored. Since action is not

proposed, there are no action-specific or location-specific ARARs identified for this alternative.

Long-Term Effectiveness and Permanence. The No Further Action alternative is not expected to be effective in the long-term because no remedial actions are proposed. Potential ecological risks have been identified because the COC would remain in place. Potential exposure to the COC would not be controlled or monitored.

Reduction of Toxicity, Mobility, or Volume. The No Further Action alternative does not include any treatment to reduce toxicity, mobility, or volume. Current estimates suggest that approximately 2,026 yd^3 of soil containing TPH measured as gasoline would remain in place.

Short-Term Effectiveness. No remedial actions are proposed; therefore, the RAOs would not be achieved. Since no remedial actions are proposed, there would not be any short-term risks to the public, worker, and/or environment.

Implementability. The No Further Action alternative would not have implementation obstacles because remedial actions are not proposed. Implementation of this alternative does not introduce additional risks.

Cost. No costs would be associated with implementing the No Further Action alternative.

Alternative 2 – Institutional Controls

Description

Alternative 2 is Institutional Controls. The goal of this alternative is to protect and the environment by eliminating the exposure pathway between the residual COC and future wetland receptors. The institutional controls would detail performance criteria specifying that the final design for the wetland must restrict excavation and erosion and monitor the depth of cover in areas where COCs are detected above their chemical-specific RAOs. The final design must maintain at least 3 feet of cover in the areas where the COC is detected above chemical-specific RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Institutional Controls alternative would be protective of the environment in the short- and long-term. TPH measures as gasoline is currently located at depths ranging from 3 to 11.5 feet bgs. The institutional controls would detail performance criteria specifying that the final design for the wetland must restrict excavation and erosion and monitor the depth of cover in areas where the COC is detected above its chemical-specific RAO.

Under this alternative, potential ecological risks would not exist for amphipods because exposure to TPH measured as gasoline would be eliminated through implementation of the final wetland design performance criteria (monitoring of cover and protection against erosion and/or excavation). No additional threats would be introduced by this alternative.

Compliance with Applicable or Relevant and Appropriate Requirements. The performance criteria specified for the Institutional Controls alternative will meet chemical-specific TBC criteria when 3 feet of stable cover cannot be provided. The alternative would prevent and monitor exposure of receptors to concentrations of TPH measured as gasoline detected

above its chemical-specific RAO. There are no action-specific or location-specific ARARs identified for this alternative.

Long-Term Effectiveness and Permanence. The Institutional Controls alternative is expected to be effective in the long-term through the use of proprietary and governmental controls. The performance criteria specified in the wetland final design would ensure implementation of restrictions on excavation and/or erosion and monitoring of the level of cover throughout the development and maturation of the wetland.

Reduction of Toxicity, Mobility, or Volume. The Institutional Controls alternative does not include any treatment to reduce toxicity, mobility, or volume. Current estimates suggest that approximately 2,026 yd^3 of soil containing TPH measured as gasoline would remain in place. However, restrictions placed on the site should reduce exposure to the constituents left in place.

Short-Term Effectiveness. The RAOs to prevent exposure of amphipods TPH measured as gasoline would be achieved by maintaining at least 3 feet of cover in areas where concentrations of the COC are detected above the chemical-specific RAO (see Figure B-12). Potential risks to workers can be controlled and minimized through proper health and safety procedures.

Implementability. The Institutional Controls alternative would have minimal implementation obstacles because the controls would be fully considered and incorporated in preparation of the final wetland design. The performance criteria and monitoring requirements are easily implementable. Enforcement and verification of the recommendations should be a priority.

Cost. Placement of cover and monitoring of the physical development of the wetland are necessary components of the wetland restoration program regardless of the need for remedial action. The performance criteria are designed to provide flexibility in the development and selection of final design and are expected to have only a minor impact on design details. Accordingly, there is no significant incremental cost associated with this alternative.

Alternative 3 – Excavation with Offsite Disposal

Description

Alternative 3 is Excavation with Offsite Disposal remedial alternative. Actions to control site-related risks would consist of conducting a pre-design investigation that would include installation of soil borings to determine the excavation geometry. Following the pre-design investigation, soil concentrations of COCs above chemical-specific RAOs would be excavated, transported, and disposed at an approved off site landfill. Confirmation samples would be collected to verify that the site achieves RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Excavation and Offsite Disposal alternative would remove soil containing TPH measured as gasoline and therefore, would be protective of the environment in the short-term and long-term.

Under this alternative, potential ecological risks would not exist for amphipods because soil containing concentrations TPH measured as gasoline detected above the chemical-specific RAO would be removed to meet RAOs.

Operations associated with the excavations would introduce some potential short-term human health risks due to the potential for direct contact or inhalation of the contaminants by workers during excavation activities. However, these risks can be controlled and minimized through proper health and safety procedures.

Compliance with Applicable or Relevant and Appropriate Requirements. The Excavation and Offsite Disposal alternative is expected to satisfy chemical-specific TBC criteria and location- and action-specific ARARs. The action-specific ARARs would be achieved through implementation of appropriate procedures, management practices, dust suppression, and air monitoring during remedial activities. In conjunction with the offsite disposal option, excavated soil would be characterized and compared to land ban restrictions prior to transport and disposal. All excavated soil would be managed, handled, and characterized using an approved plan prior to transporting offsite.

Long-Term Effectiveness and Permanence. The Excavation and Offsite Disposal alternative is expected to be effective in the long-term because soil containing TPH measured as gasoline would be physically removed from the site. This would immediately reduce the site risks and achieve RAOs. Removal of the soil would be confirmed with confirmation samples. Excavation would provide the greatest degree of effectiveness and permanence because the concentrations of the TPH measured as gasoline detected above the chemical-specific RAO would be removed from the site and disposed of at an appropriate offsite facility.

Reduction of Toxicity, Mobility, or Volume. The Excavation and Offsite Disposal alternative would provide a high degree of mobility reduction because the soil containing TPH measured as gasoline would be removed from the site. Excavation would achieve RAOs. Although the soil would be disposed of at an offsite facility, toxicity and volume would not be reduced since no treatment of the soil is proposed.

Short-Term Effectiveness. Excavation would achieve the RAOs at the completion of the removal and disposal activities. There is a potential for release of fugitive dusts during the remedial action activities; however, this would be mitigated by developing and implementing appropriate health and safety procedures. Additionally, there may be short-term risks to the public and/or workers during excavation activities through exposure, handling, and transport of the contaminated materials.

Implementability. The Excavation and Offsite Disposal alternative technology is well established and is technically and administratively implementable. However, the presence of site-specific obstacles, such as the 54-inch concrete line, may complicate excavation and removal activities. There are no other site-specific obstacles that should complicate excavation and removal activities.

Cost. Cost estimates are provided in Appendix C. These costs are order-of-magnitude level estimates consistent with EPA requirements for a feasibility study for which cost estimates have an accuracy of plus 50 percent to minus 30 percent. The estimated cost for the excavation and offsite disposal alternative is $625,306.

The cost estimates have been prepared from the best available data at the time of the estimate for guidance in project evaluation and implementation. The final cost of the project would depend on the actual labor and material costs, actual site conditions, final project scope and design, productivity, competitive market conditions, final project schedule, and other variable factors. As a result, the final project costs may vary from those presented in this FFS.

Alternative 4 – Excavation with Onsite Disposal

Description

Alternative 4 is Excavation with Onsite Disposal. Actions to control site-related risks would consist of conducting a pre-design investigation that would include installation of soil borings to determine the excavation geometry. Following the pre-design investigation, soil containing COCs detected above chemical-specific RAOs would be excavated and transported to an onsite location for consolidation and disposal. Confirmation samples would be collected to verify that the site achieves RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Excavation and Offsite Disposal alternative would remove soil containing TPH measured as gasoline and therefore, would be protective of the environment in the short-term and long-term.

Under this alternative, potential ecological risks would not exist for amphipods because soil containing concentrations of TPH measured as gasoline detected above the chemical-specific RAO would be removed to meet RAOs.

Operations associated with the excavations would introduce some potential short-term human health risks due to the potential for direct contact or inhalation of the contaminants by workers during excavation activities. However, these risks can be controlled and minimized through proper health and safety procedures.

Compliance with Applicable or Relevant and Appropriate Requirements. The Excavation and Onsite Disposal alternative is expected to satisfy chemical-specific TBC criteria and location- and action-specific ARARs. The action-specific ARARs would be achieved through implementation of appropriate procedures, management practices, dust suppression, and air monitoring during remedial activities. In conjunction with the onsite disposal option, excavated soil would be characterized prior to transport to the onsite consolidation area for disposal. All excavated soil would be managed, handled, and characterized using an approved plan prior to transporting and consolidating onsite.

Long-Term Effectiveness and Permanence. The Excavation and Onsite Disposal alternative is expected to be effective in the long-term because the soil containing TPH measured as gasoline would be physically removed from the site. This would immediately reduce the site risk. Removal of soil containing the COC would be confirmed with confirmation samples. Excavation would provide the greatest degree of effectiveness and permanence at the site because the soil containing the COC would be removed from the site. However, the soil would be disposed of at an approved onsite consolidation/disposal location; therefore, the contaminants remain would on the BRAC Property.

Reduction of Toxicity, Mobility, or Volume. The Excavation and Onsite Disposal alternative would reduce mobility at the ONSFL-54 inch drain line segment because the soil containing the COC would be removed from the site and disposed of at an approved onsite location. Excavation would achieve the RAOs and reduce the site risks. However, soil containing the COC would remain on the BRAC Property. There would not be a reduction, but rather a transfer of toxicity and volume from the ONSFL-54 inch drain line segment to the onsite consolidation site. The engineered cap would reduce infiltration of precipitation and potential contaminant migration. Landfill gases (if present) would be passively vented above the breathing zone.

Short-Term Effectiveness. Excavation would achieve the RAOs at the completion of the removal and disposal activities. There is a potential for release of fugitive dusts during the remedial action activities; however, this would be mitigated by developing and implementing appropriate health and safety procedures. Additionally, there may be short-term risks to the public and/or workers during excavation activities through exposure, handling, and transport of soil.

Implementability. The Excavation and Onsite Disposal technology is well established and is technically and administratively implementable. This alternative may encounter opposition to obtaining permitting for installation of a Class II landfill on the BRAC Property. The excavated materials are expected to be nonhazardous, but would be considered designated waste and would require Class II management. The presence of site-specific obstacles, such as the 54-inch drain line segment, may complicate excavation and removal activities.

At the onsite consolidation site, a Class II non-municipal solid waste landfill would have to be designed, permitted, and installed prior to excavating and transporting site soil from the Inboard Area site for disposal. Following consolidation of all the onsite excavated soil, the landfill would required the installation of an engineered cap for closure.

Cost. Cost estimates are provided in Appendix C. These costs are order-of-magnitude level estimates consistent with EPA requirements for a feasibility study for which cost estimates have an accuracy of plus 50 percent to minus 30 percent. The estimated cost of the excavation and onsite disposal alternative is $17,623. This does not include the cost for construction and capping of the consolidation site.

The cost estimates have been prepared from the best available data at the time of the estimate for guidance in project evaluation and implementation. The final cost of the project would depend on the actual labor and material costs, actual site conditions, final project scope and design, productivity, competitive market conditions, final project schedule, and other variable factors. As a result, the final project costs may vary from those presented in this FFS.

Onshore Fuel Line – Hangar Segment

The following presents the detailed evaluation for the No Further Action, Institutional Control, Excavation with Offsite Disposal, and Excavation with Onsite Disposal remedial alternatives for the ONSFL–Hangar Segment. TPH measured as gasoline and JP-4, ethylbenzene, xylenes, and PAHs were the COCs identified in the soil which would pose a potential risk to human and ecological receptors if these receptors were exposed to COCs during the development and maturation of the wetland. Figure B-13 identifies the areas

where remedial action is proposed (i.e., the areas where residual concentrations of COCs detected above chemical-specific RAOs) at the ONSFL-Hangar Segment.

Alternative 1 – No Further Action

Description

Alternative 1 is No Further Action. No actions would be initiated to control potential site-related risks.

Assessment

Overall Protection of Human Health and the Environment. The No Further Action alternative would not be protective of human health and the environment in the short-term or long-term. Although residual COCs are currently located at depths ranging from 0.5 to 8 feet bgs, under this alternative potential risks to human health and the environment would exist. The potential risk would exist because a minimum of 3 feet of cover is not provided, the potential for erosion or excavation would not be controlled, and the presence of cover would not be monitored. Under this alternative, potential ecological risks would exist for amphipods, Salmonid, algae, and bay shrimp because of exposure to petroleum hydrocarbons (amphipods only), ethylbenzene, xylenes (amphipods and bay shrimp only), and PAHs (amphipods only) in soil would not be controlled or mitigated. Similarly, potential human health risk (ILCR greater than $1x10^{-6}$) would also exist from exposure (marsh recreational scenario) to PAHs (i.e. benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd pyrene). No additional threats would be introduced by this alternative.

Compliance with Applicable or Relevant and Appropriate Requirements. The No Further Action alternative does not achieve the chemical-specific TBC criteria. The COCs would remain in place, and exposure would not be controlled or monitored. Since action is not proposed, there are no action- or location-specific ARARs identified for this alternative.

Long-Term Effectiveness and Permanence. The No Further Action alternative is not expected to be effective in the long-term because no remedial actions are proposed. Potential human health and ecological risks have been identified because COCs would remain in place. Potential exposure to COCs would not be controlled or monitored.

Reduction of Toxicity, Mobility, or Volume. The No Further Action alternative does not include any treatment to reduce toxicity, mobility, or volume. Current estimates suggest that approximately 2,150 yd^3 of soil containing TPH measured as gasoline and JP-4, ethylbenzene, xylenes, and PAHs would remain in place.

Short-Term Effectiveness. No remedial actions are proposed; therefore, the RAOs would not be achieved. Since no remedial actions are proposed, there would not be any short-term risks to the public, worker, and/or environment.

Implementability. The No Further Action alternative would not have implementation obstacles because remedial actions are not proposed. Implementation of this alternative does not introduce additional risks.

Cost. No costs would be associated with implementing the No Further Action alternative.

Alternative 2 – Institutional Controls

Description

Alternative 2 is Institutional Controls. The goal of this alternative is to protect human health and the environment by eliminating the exposure pathway between residual COCs and future wetland receptors. The institutional controls would detail performance criteria specifying that the final design for the wetland must restrict excavation and erosion and monitor the depth of cover in areas where COCs are detected above chemical-specific RAOs. The final design must maintain at least 3 feet of cover in the areas where COCs are detected above chemical-specific RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Institutional Controls alternative would be protective of human health and the environment in the short-term and long-term. Residual COCs are currently located at depths ranging from 0.5 to 8 feet bgs. The institutional would detail performance criteria specifying that the final design for the wetland must provide a minimum of 3 feet of cover, restrict excavation and erosion, and monitor the depth of cover in the areas where COCs were detected above chemical-specific RAOs. No additional threats would be introduced by this alternative.

Under this alternative, potential ecological risks would not exist for amphipods, algae, salmonid, and bay shrimp because exposure to COCs would be eliminated through implementation of the wetland final design performance criteria (provide cover, monitoring of cover, and protection against erosion and/or excavation). Similarly, potential human health risks would not exist from exposure (marsh recreational scenario) to PAHs.

Compliance with Applicable or Relevant and Appropriate Requirements. The performance criteria specified for the Institutional Controls alternative will meet chemical-specific TBC criteria when 3 feet of stable cover cannot be provided. The alternative would prevent and monitor exposure of receptors to concentrations of COCs detected above chemical-specific RAOs. There are no action- or location-specific ARARs identified for this alternative.

Long-Term Effectiveness and Permanence. The Institutional Controls alternative is expected to be effective in the long-term through the use of proprietary and governmental controls. The performance criteria specified in the wetland final design would ensure a minimum of 3 feet of cover would be provided, and would implement restrictions on excavation and/or erosion and monitoring of the level of cover throughout the development and maturation of the wetland.

Reduction of Toxicity, Mobility, or Volume. The Institutional Controls alternative does not include any treatment to reduce toxicity, mobility, or volume. Current estimates suggest approximately 2,150 yd^3 of soil containing TPH measured as gasoline and JP-4, VOCs, and PAHs would remain in place. However, performance criteria for applying cover, monitoring cover, and prevention of erosion or excavation of cover at the site would eliminate exposure to concentrations TPH measured as gasoline and JP-4 detected above chemical-specific RAOs.

Short-Term Effectiveness. The RAOs to prevent exposure of amphipods, algae, salmonid, bay shrimp, and humans to COCs would be achieved by maintaining at least 3 feet of cover in areas where concentrations of COCs are detected above chemical-specific RAOs (see

Figure B-13). Potential risks to workers can be controlled and minimized through proper health and safety procedures.

Implementability. The Institutional Controls alternative would have minimal implementation obstacles because the controls would be fully considered and incorporated in preparation of the final wetland design. The performance criteria and monitoring requirements are easily implementable. Enforcement and verification of the recommendations should be a priority.

Cost. Placement of cover and monitoring of the physical development of the wetland are necessary components of the wetland restoration program regardless of the need for remedial action. The performance criteria are designed to provide flexibility in the development and selection of final design and are expected to have only a minor impact on design details. Accordingly, there is no significant incremental cost associated with this alternative.

Alternative 3 – Excavation with Offsite Disposal

Description

Alternative 3 is Excavation with Offsite Disposal remedial alternative. Actions to control site-related risks would consist of conducting a pre-design investigation that would include installation of soil borings to determine the excavation geometry. Following the pre-design investigation, soil concentrations of COCs above chemical-specific RAOs would be excavated, transported, and disposed at an approved off site landfill. Confirmation samples would be collected to verify that the site achieves RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Excavation and Offsite Disposal alternative would remove soil containing TPH measured as gasoline and JP-4 VOCs and PAHs and therefore would be protective of the environment in the short-term and long-term.

Under this alternative, potential human and ecological risks would not exist for amphipods because soil containing concentrations of TPH measured as gasoline and JP-4 VOCs, and PAHs detected above chemical-specific RAOs would be removed to meet RAOs.

Operations associated with the excavations would introduce some potential short-term human health risks due to the potential for direct contact or inhalation of the contaminants by workers during excavation activities. However, these risks can be controlled and minimized through proper health and safety procedures.

Compliance with Applicable or Relevant and Appropriate Requirements. The Excavation and Offsite Disposal alternative is expected to satisfy chemical-specific TBC criteria and location- and action-specific ARARs. The action-specific ARARs would be achieved through implementation of appropriate procedures, management practices, dust suppression, and air monitoring during remedial activities. In conjunction with the offsite disposal option, excavated soil would be characterized and compared to land ban restrictions prior to transport and disposal. All excavated soil would be managed, handled, and characterized using an approved plan prior to transporting offsite.

Long-Term Effectiveness and Permanence. The Excavation and Offsite Disposal alternative is expected to be effective in the long-term because soil containing COCs would be physically removed from the site, which would immediately reduce the site risks and achieve RAOs. Removal of the soil would be confirmed with confirmation samples. Excavation would provide the greatest degree of effectiveness and permanence because the concentrations COCs detected above chemical-specific RAOs would be removed from the site and disposed at an appropriate offsite facility.

Reduction of Toxicity, Mobility, or Volume. The Excavation and Offsite Disposal alternative would provide a high degree of mobility reduction because the soil containing COCs would be removed from the site. Excavation would achieve RAOs. Although the soil would be disposed of at an offsite facility, toxicity and volume would not be reduced since no treatment of the soil is proposed.

Short-Term Effectiveness. Excavation would achieve the RAOs at the completion of the removal and disposal activities. There is a potential for release of fugitive dusts during the remedial action activities; however, this would be mitigated by developing and implementing appropriate health and safety procedures. Additionally, there may be short-term risks to the public and/or workers during excavation activities through exposure, handling, and transport of the contaminated materials.

Implementability. The Excavation and Offsite Disposal alternative technology is well established and is technically and administratively implementable. However, the presence of site-specific obstacles, such as asphalt, may complicate excavation and removal activities.

Cost. Cost estimates are provided in Appendix C. These costs are order-of-magnitude level estimates consistent with EPA requirements for a feasibility study for which cost estimates have an accuracy of plus 50 percent to minus 30 percent. The estimated cost for the excavation and offsite disposal alternative is $701,748.

The cost estimates have been prepared from the best available data at the time of the estimate for guidance in project evaluation and implementation. The final cost of the project would depend on the actual labor and material costs, actual site conditions, final project scope and design, productivity, competitive market conditions, final project schedule, and other variable factors. As a result, the final project costs may vary from those presented in this FFS.

Alternative 4 – Excavation with Onsite Disposal

Description

Alternative 4 is Excavation with Onsite Disposal. Actions to control site-related risks would consist of conducting a pre-design investigation that would include installation of soil borings to determine the excavation geometry. Following the pre-design investigation, soil containing COCs detected above chemical-specific RAOs would be excavated and transported to an onsite location for consolidation and disposal. Confirmation samples would be collected to verify that the site achieves RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Excavation and Onsite Disposal alternative would remove soil containing TPH measured as gasoline and JP-4

VOCs, and PAHs and therefore, would be protective of the environment in the short-term and long-term.

Under this alternative, potential human and ecological risks would not exist for amphipods because soil containing concentrations TPH measured as gasoline and JP-4 VOCs, and PAHs detected above chemical-specific RAOs would be removed to meet RAOs.

Operations associated with the excavations would introduce some potential short-term human health risks due to the potential for direct contact or inhalation of the contaminants by workers during excavation activities. However, these risks can be controlled and minimized through proper health and safety procedures.

Compliance with Applicable or Relevant and Appropriate Requirements. The Excavation and Onsite Disposal alternative is expected to satisfy chemical-specific TBC criteria and location- and action-specific ARARs. The action-specific ARARs would be achieved through implementation of appropriate procedures, management practices, dust suppression, and air monitoring during remedial activities. In conjunction with the onsite disposal option, excavated soil would be characterized prior to transport to the onsite consolidation area for disposal. All excavated soil would be managed, handled, and characterized using an approved plan prior to transporting and consolidating onsite.

Long-Term Effectiveness and Permanence. The Excavation and Onsite Disposal alternative is expected to be effective in the long-term because the soil containing petroleum hydrocarbons, VOCs, and PAHs would be physically removed from the site. This would immediately reduce the site risk. Removal of impacted soil would be confirmed with confirmation samples. Excavation would provide the greatest degree of effectiveness and permanence at the site because the soil containing the COCs would be removed from the site. However, the soil would be disposed of at an approved onsite consolidation/disposal location; therefore, the contaminants would remain on the BRAC Property.

Reduction of Toxicity, Mobility, or Volume. The Excavation and Onsite Disposal alternative would reduce mobility at the ONSFL-Hangar segment because the soil containing the COCs would be removed from the site and disposed of at an approved onsite location. Excavation would achieve the RAOs and reduce the site risks. However, soil containing the COCs would remain on the BRAC Property. There would not be a reduction, but rather a transfer of toxicity and volume from the ONSFL-Hangar segment to the onsite consolidation site. The engineered cap would reduce infiltration of precipitation and potential contaminant migration. Landfill gases (if present) would be passively vented above the breathing zone.

Short-Term Effectiveness. Excavation would achieve the RAOs at the completion of the removal and disposal activities. There is a potential for release of fugitive dusts during the remedial action activities; however, this would be mitigated by developing and implementing appropriate health and safety procedures. Additionally, there may be short-term risks to the public and/or workers during excavation activities through exposure, handling, and transport of soil.

Implementability. The Excavation and Onsite Disposal technology is well established and is technically and administratively implementable. This alternative may encounter opposition in obtaining a permit a for installation of a Class II landfill on the BRAC Property. The

excavated materials are expected to be nonhazardous, but would be considered designated waste and would require Class II management.

The presence of site-specific obstacles, such as asphalt, may complicate excavation and removal activities. At the onsite consolidation site, a Class II non-municipal solid waste landfill would have to be designed, permitted, and installed prior to excavating and transporting site soil for disposal. Following consolidation of all the Onsite excavated soil, the landfill would required the installation of an engineered cap for closure.

Cost. Cost estimates are provided in Appendix C. These costs are order-of-magnitude level estimates consistent with EPA requirements for a feasibility study for which cost estimates have an accuracy of plus 50 percent to minus 30 percent. The estimated cost for the excavation and onsite disposal alternative is $52,976. This does not include the cost for construction and capping of the consolidation site.

The cost estimates have been prepared from the best available data at the time of the estimate for guidance in project evaluation and implementation. The final cost of the project would depend on the actual labor and material costs, actual site conditions, final project scope and design, productivity, competitive market conditions, final project schedule, and other variable factors. As a result, the final project costs may vary from those presented in this FFS.

Onshore Fuel Line – Northern Segment

The following presents the detailed evaluation for the No Further Action, Institutional Control, Excavation with Offsite Disposal, and Excavation with Onsite Disposal remedial alternatives for the ONSFL–Northern Segment. TPH measured as gasoline was the only COC identified, to pose a potential risk to ecological receptors if these receptors were exposed to the COC during the development and maturation of the wetland. Figure B-14 identifies the areas where remedial action is proposed (i.e., the areas where residual concentrations of COCs are detected above chemical-specific RAOs) at the ONSFL-Northern Segment.

Alternative 1 – No Further Action

Description

Alternative 1 is No Further Action. No actions would be initiated to control potential site-related risks.

Assessment

Overall Protection of Human Health and the Environment. The No Further Action alternative would not be protective of the environment in the short- or long-term. Although the residual COC (TPH measured as gasoline) is currently located at depths ranging from 0.5 to 5.5 feet bgs, under this alternative, potential risks to the environment would exist. The potential risk would exist because a minimum of 3 feet of cover is not provided, the potential for erosion or excavation would not be controlled, and the presence of cover would not be monitored. Under this alternative, potential ecological risks would exist for amphipods because exposure to TPH measured as gasoline in soil would not be controlled or mitigated. No additional threats would be introduced by this alternative.

Compliance with Applicable or Relevant and Appropriate Requirements. The No Further Action alternative does not achieve the chemical-specific TBC criteria. The COC would remain in place, and exposure would not be controlled or monitored. Since action is not proposed, there are no action-specific or location-specific ARARs identified for this alternative.

Long-Term Effectiveness and Permanence. The No Further Action alternative is not expected to be effective in the long-term because no remedial actions are proposed. Potential ecological risks have been identified because the COC would remain in place. Potential exposure to the COC would not be controlled or monitored.

Reduction of Toxicity, Mobility, or Volume. The No Further Action alternative does not include any treatment to reduce toxicity, mobility, or volume. Current estimates suggest that approximately 1,807 yd^3 of soil containing TPH measured as gasoline would remain in place.

Short-Term Effectiveness. No remedial actions are proposed; therefore, the RAOs would not be achieved. Since no remedial actions are proposed, there would not be any short-term risks to the public, worker, and/or environment.

Implementability. The No Further Action alternative would not have implementation obstacles because remedial actions are not proposed. Implementation of this alternative does not introduce additional risks.

Cost. No costs would be associated with implementing the No Further Action alternative.

Alternative 2 – Institutional Controls

Description

Alternative 2 is Institutional Controls. The goal of this alternative is to protect the environment by eliminating the exposure pathway between the residual COC and future wetland receptors. The institutional controls would detail performance criteria specifying that the final design for the wetland must restrict excavation and erosion and monitor the depth of cover in areas where the COC is detected above chemical-specific RAOs. The final design must maintain at least 3 feet of cover in the areas where COCs are detected above chemical-specific RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Institutional Controls alternative would be protective of the environment in the short-term and long-term. The COC is currently located at depths ranging from 0.5 to 5.5 feet bgs. The institutional controls alternative would detail performance criteria specifying that the final design for the wetland must: provide a minimum of 3 feet of cover, restrict excavation and erosion, and monitor the depth of cover in areas where TPH measured as gasoline is detected above chemical-specified RAO.

Under this alternative, potential ecological risks would not exist for amphipods because exposure to TPH measured as gasoline would be eliminated through implementation of the wetland final design performance criteria (providing cover, monitoring of cover, and protection against erosion and/or excavation). No additional threats would be introduced by this alternative.

Compliance with Applicable or Relevant and Appropriate Requirements. The performance criteria specified for the Institutional Controls alternative will meet chemical-specific TBC criteria when 3 feet of cover cannot be provided. The alternative would prevent and monitor exposure of receptors to concentrations of the COC detected above chemical-specific RAOs. There are no action-specific or location-specific ARARs identified for this alternative.

Long-Term Effectiveness and Permanence. The Institutional Controls alternative is expected to be effective in the long-term through the use of proprietary and governmental controls. The performance criteria specified in the wetland final design would ensure a minimum of 3 feet of cover would be provided, and would implement of restrictions on excavation and/or erosion and monitor the level of cover throughout the development and maturation of the wetland.

Reduction of Toxicity, Mobility, or Volume. The Institutional Controls alternative does not include any treatment to reduce toxicity, mobility, or volume. Current estimates suggest that approximately 1,807 yd^3 of soil containing TPH-measured as gasoline would remain in place. However, performance criteria for applying cover, monitoring cover, and prevention of erosion or excavation of cover at the site would eliminate exposure to concentrations of TPH measured as gasoline detected above the chemical-specific RAO.

Short-Term Effectiveness. The RAO to prevent exposure of amphipods to TPH measured as gasoline would be achieved by maintaining at least 3 feet of cover in areas where the COC is detected above the chemical-specific RAO. The workers would be adequately protected.

Implementability. The Institutional Controls alternative would have minimal implementation obstacles because the controls would be fully considered and incorporated in preparation of the final wetland design. The performance criteria and monitoring requirements are easily implementable. Enforcement and verification of the recommendations should be a priority.

Cost. Placement of cover and monitoring of the physical development of the wetland are necessary components of the wetland restoration program regardless of the need for remedial action. The performance criteria are designed to provide flexibility in the development and selection of final design and are expected to have only a minor impact on design details. Accordingly, there is no significant incremental cost associated with this alternative.

Alternative 3 – Excavation with Offsite Disposal

Description

Alternative 3 is Excavation with Offsite Disposal remedial alternative. Actions to control site-related risks would consist of conducting a pre-design investigation that would include installation of soil borings to determine the excavation geometry. Following the pre-design investigation, soil concentrations of COCs above their chemical-specific RAOs would be excavated, transported, and disposed at an approved off site landfill. Confirmation samples would be collected to verify that the site achieves RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Excavation and Offsite Disposal alternative would remove soil containing TPH measured as gasoline and therefore, would be protective of the environment in the short-term and long-term.

Under this alternative, potential ecological risks would not exist for amphipods because soil containing concentrations TPH measured as gasoline detected above chemical-specific RAO would be removed to meet RAOs.

Operations associated with the excavations would introduce some potential short-term human health risks due to the potential for direct contact or inhalation of the contaminants by workers during excavation activities. However, these risks can be controlled and minimized through proper health and safety procedures.

Compliance with Applicable or Relevant and Appropriate Requirements. The Excavation and Offsite Disposal alternative is expected to satisfy chemical-specific TBC criteria and location- and action-specific ARARs. The action-specific ARARs would be achieved through implementation of appropriate procedures, management practices, dust suppression, and air monitoring during remedial activities. In conjunction with the offsite disposal option, excavated soil would be characterized and compared to land ban restrictions prior to transport and disposal. All excavated soil would be managed, handled, and characterized using an approved plan prior to transporting offsite.

Long-Term Effectiveness and Permanence. The Excavation and Offsite Disposal alternative is expected to be effective in the long-term because soil containing TPH measured as gasoline would be physically removed from the site, which would immediately reduce the site risks and achieve RAOs. Removal of the soil would be confirmed with confirmation samples. Excavation would provide the greatest degree of effectiveness and permanence because the concentrations TPH measured as gasoline detected above the chemical-specific RAO requiring further action would be removed from the site and disposed at an appropriate offsite facility.

Reduction of Toxicity, Mobility, or Volume. The Excavation and Offsite Disposal alternative would provide a high degree of mobility reduction because the soil containing the COC would be removed from the site. Excavation would achieve RAOs. Although the soil would be disposed at an offsite facility, toxicity and volume would not be reduced since no treatment of the soil is proposed.

Short-Term Effectiveness. Excavation would achieve the RAOs at the completion of the removal and disposal activities. There is a potential for release of fugitive dusts during the remedial action activities; however, this would be mitigated by developing and implementing appropriate health and safety procedures. Additionally, there may be short-term risks to the public and/or workers during excavation activities through exposure, handling, and transport of the contaminated materials.

Implementability. The Excavation and Offsite Disposal alternative technology is well established and is implementable both technically and administratively. There are no site-specific obstacles that would complicate excavation and removal activities.

Cost. Cost estimates are provided in Appendix C. These costs are order-of-magnitude level estimates consistent with EPA requirements for a feasibility study for which cost estimates have an accuracy of plus 50 percent to minus 30 percent. The estimated cost for the excavation and offsite disposal alternative is $571,294.

The cost estimates have been prepared from the best available data at the time of the estimate for guidance in project evaluation and implementation. The final cost of the project would depend on the actual labor and material costs, actual site conditions, final project scope and design, productivity, competitive market conditions, final project schedule, and other variable factors. As a result, the final project costs may vary from those presented in this FFS.

Alternative 4 – Excavation with Onsite Disposal

Description

Alternative 4 is Excavation with Onsite Disposal. Actions to control site-related risks would consist of conducting a pre-design investigation that would include installation of soil borings to determine the excavation geometry. Following the pre-design investigation, soil containing COCs detected above their chemical-specific RAOs would be excavated and transported to an onsite location for consolidation and disposal. Confirmation samples would be collected to verify that the site achieves RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Excavation and Offsite Disposal alternative would remove soil containing TPH measured as gasoline and therefore, would be protective of the environment in the short-term and long-term.

Under this alternative, potential ecological risks would not exist for amphipods because soil containing concentrations TPH measured as gasoline detected above the chemical-specific RAO would be removed to meet RAOs.

Operations associated with the excavations would introduce some potential short-term human health risks due to the potential for direct contact or inhalation of the contaminants by workers during excavation activities. However, these risks can be controlled and minimized through proper health and safety procedures.

Compliance with Applicable or Relevant and Appropriate Requirements. The Excavation and Onsite Disposal alternative is expected to satisfy chemical-specific TBC criteria and location- and action-specific ARARs. The action-specific ARARs would be achieved through implementation of appropriate procedures, management practices, dust suppression, and air monitoring during remedial activities. In conjunction with the onsite disposal option, excavated soil would be characterized prior to transport to the onsite consolidation area for disposal. All excavated soil would be managed, handled, and characterized using an approved plan prior to transporting and consolidating onsite.

Long-Term Effectiveness and Permanence. The Excavation and Onsite Disposal alternative is expected to be effective in the long-term because the soil containing TPH measured as gasoline would be physically removed from the site, which would immediately reduce the site risk. Removal of impacted soil would be confirmed with confirmation samples. Excavation would provide the greatest degree of effectiveness and permanence at the site

because the soil containing the COC would be removed from the site. However, the soil would be disposed of at an approved onsite consolidation/disposal location; therefore, the contaminants would remain on the BRAC Property.

Reduction of Toxicity, Mobility, or Volume. The Excavation and Onsite Disposal alternative would reduce mobility at the ONSFL-Northern segment because the soil containing the COC would be removed from the site and disposed at an approved onsite location. Excavation would achieve the RAOs and reduce the site risks. However, soil containing the COC would remain on the BRAC Property. There would not be a reduction, but rather a transfer of toxicity and volume from the ONSFL-Northern segment to the onsite consolidation site. The engineered cap would reduce infiltration of precipitation and potential contaminant migration. Landfill gases (if present) would be passively vented above the breathing zone.

Short-Term Effectiveness. Excavation would achieve the RAOs at the completion of the removal and disposal activities. There is a potential for release of fugitive dusts during the remedial action activities; however, this would be mitigated by developing and implementing appropriate health and safety procedures. Additionally, there may be short-term risks to the public and/or workers during excavation activities through exposure, handling, and transport of soil.

Implementability. The Excavation and Onsite Disposal technology is well established and is technically and administratively implementable. This alternative may encounter opposition to obtaining a permit for installation of a Class II landfill on the BRAC Property. The excavated materials are expected to be nonhazardous, but would be considered designated waste and would require Class II management.

At the onsite consolidation site, a Class II non-municipal solid waste landfill would have to be designed, permitted, and installed prior to excavating and transporting site soil from the Inboard Area site for disposal. Following consolidation of all the onsite excavated soil, the landfill would require the installation of an engineered cap for closure.

Cost. Cost estimates are provided in Appendix C. These costs are order-of-magnitude level estimates consistent with EPA requirements for a feasibility study for which cost estimates have an accuracy of plus 50 percent to minus 30 percent. The estimated cost for the excavation and onsite disposal alternative is $29,346. This does not include the cost for construction and capping of the consolidation site.

The cost estimates have been prepared from the best available data at the time of the estimate for guidance in project evaluation and implementation. The final cost of the project would depend on the actual labor and material costs, actual site conditions, final project scope and design, productivity, competitive market conditions, final project schedule, and other variable factors. As a result, the final project costs may vary from those presented in this FFS.

Northwest Runway Area

The following presents the detailed evaluation for the No Further Action, Institutional Control, Excavation with Offsite Disposal, and Excavation with Onsite Disposal remedial alternatives for the Northwest Runway Area. Metals (beryllium and boron) were the COCs

identified in the soil which would pose a potential risk to ecological receptors if these receptors were exposed to COCs during the development and maturation of the wetland. Figure B-15 identifies the area where remedial action is proposed (i.e., the area where residual concentrations of COCs are detected above chemical-specific RAOs) at the Northwest Runway Area.

Alternative 1 – No Further Action

Description

Alternative 1 is No Further Action. No actions would be initiated to control potential site-related risks.

Assessment

Overall Protection of Human Health and the Environment. The No Further Action alternative would not be protective of the environment in the short-term or long-term. Although residual COCs are currently located at depths ranging from 5 to 15 feet bgs, potential risks to the environment would exist. The potential risk would exist because throughout the development and maturation of the wetland the potential for erosion or excavation would not be controlled and the presence of cover would not be monitored. Under this alternative, potential ecological risks would exist for amphipods and pickleweed because exposure to beryllium (amphipod only) and boron (pickleweed only) in soil would not be controlled or mitigated. No additional threats would be introduced by this alternative.

Compliance with Applicable or Relevant and Appropriate Requirements. The No Further Action alternative does not achieve the chemical-specific TBC criteria. The COCs would remain in place, and exposure would not be controlled or monitored. Since action is not proposed, there are no action- or location-specific ARARs identified for this alternative.

Long-Term Effectiveness and Permanence. The No Further Action alternative is not expected to be effective in the long-term because no remedial actions are proposed. Potential ecological risks have been identified because COCs would remain in place. Potential exposure to COCs would not be controlled or monitored.

Reduction of Toxicity, Mobility, or Volume. The No Further Action alternative does not include any treatment to reduce toxicity, mobility, or volume. Current estimates suggest approximately 222 yd^3 of soil containing metals would remain in place.

Short-Term Effectiveness. No remedial actions are proposed; therefore, the RAOs would not be achieved. Since no remedial actions are proposed, there would not be any short-term risks to the public, worker, and/or environment.

Implementability. The No Further Action alternative would not have implementation obstacles because remedial actions are not proposed. Implementation of this alternative does not introduce additional risks.

Cost. No costs would be associated with implementing the No Further Action alternative.

Alternative 2 – Institutional Controls

Description

Alternative 2 is Institutional Controls. The goal of this alternative is to protect the environment by eliminating the exposure pathway between residual COCs and future wetland receptors. The institutional controls would detail performance criteria specifying that the final design for the wetland must restrict excavation and erosion and monitor the depth of cover in areas where COCs are detected above chemical-specific RAOs. The final design must maintain at least 3 feet of cover in the areas where COCs are detected above chemical-specific RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Institutional Controls alternative would be protective of human health and the environment in the short-term and long-term. COCs are present at depths ranging from 5 to 15 feet bgs. The institutional controls would detail performance criteria specifying that the final design for the wetland must restrict excavation and erosion and monitor the depth of cover in areas where COCs are detected above chemical-specific RAOs.

Under this alternative potential ecological risks would not exist for amphipods and pickleweed because exposure to metals would be eliminated through implementation of the final design performance criteria (monitoring of cover and protection against erosion and/or excavation). No additional threats would be introduced by this alternative.

Compliance with Applicable or Relevant and Appropriate Requirements. The performance criteria specified for the Institutional Controls alternative will meet chemical-specific TBC criteria when 3 feet of stable cover cannot be provided. The alternative would prevent and monitor exposure of receptors to concentrations of COCs detected above chemical-specific RAOs. There are no action-specific or location-specific ARARs identified for this alternative.

Long-Term Effectiveness and Permanence. The Institutional Controls alternative is expected to be effective in the long-term through the use of proprietary and governmental controls. The performance criteria specified in the wetland final design would ensure implementation of restrictions on excavation and/or erosion and monitoring of the level of cover throughout the development and maturation of the wetland.

Reduction of Toxicity, Mobility, or Volume. The Institutional Controls alternative does not include any treatment to reduce toxicity, mobility, or volume. Current estimates suggest that approximately 222 yd^3 of soil containing metals would remain in place. However, performance criteria for monitoring of cover and prevention of erosion or excavation of cover at the site would eliminate exposure to concentrations of metals detected above chemical-specific RAOs.

Short-Term Effectiveness. The RAOs to prevent exposure of amphipods and pickleweed to metals would be achieved by maintaining at least 3 feet of cover in the areas where concentrations of COCs are detected above chemical-specific RAOs (see Figure B-15). Potential risks can be controlled and minimized through proper health and safety procedures.

Implementability. The Institutional Controls alternative would have minimal implementation obstacles because the controls would be fully considered and incorporated in preparation of the final wetland design. The performance criteria and monitoring requirements are easily implementable. Enforcement and verification of the recommendations should be a priority.

Cost. Placement of cover and monitoring of the physical development of the wetland are necessary components of the wetland restoration program regardless of the need for remedial action. The performance criteria are designed to provide flexibility in the development and selection of final design and are expected to have only a minor impact on design details. Accordingly, there is no significant incremental cost associated with this alternative.

Alternative 3 – Excavation with Offsite Disposal

Description

Alternative 3 is Excavation with Offsite Disposal remedial alternative. Actions to control site-related risks would consist of conducting a pre-design investigation that would include installation of soil borings to determine the excavation geometry. Following the pre-design investigation, soil concentrations of COCs above chemical-specific RAOs would be excavated, transported, and disposed at an approved off site landfill. Confirmation samples would be collected to verify that the site achieves RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Excavation and Offsite Disposal alternative would remove soil containing metals and therefore, would be protective of the environment in the short- and long-term.

Under this alternative, potential ecological risks would not exist for amphipods and pickleweed because soil containing concentrations of metals detected above chemical-specific RAOs would be removed to meet RAOs.

Operations associated with the excavations would introduce some potential short-term human health risks due to the potential for direct contact or inhalation of the contaminants by workers during excavation activities. However, these risks can be controlled and minimized through proper health and safety procedures.

Compliance with Applicable or Relevant and Appropriate Requirements. The Excavation and Offsite Disposal alternative is expected to satisfy chemical-specific TBC criteria and location- and action-specific ARARs. The action-specific ARARs would be achieved through implementation of appropriate procedures, management practices, dust suppression, and air monitoring during remedial activities. In conjunction with the offsite disposal option, excavated soil would be characterized and compared to land ban restrictions prior to transport and disposal. All excavated soil would be managed, handled, and characterized using an approved plan prior to transporting offsite.

Long-Term Effectiveness and Permanence. The Excavation and Offsite Disposal alternative is expected to be effective in the long-term because soil containing metals would be physically removed from the site. This would immediately reduce the site risks and achieve RAOs. Removal of the soil would be confirmed with confirmation samples. Excavation

would provide the greatest degree of effectiveness and permanence because the concentrations metals detected above their chemical-specific RAOs would be removed from the site and disposed of at an appropriate offsite facility.

Reduction of Toxicity, Mobility, or Volume. The Excavation and Offsite Disposal alternative would provide a high degree of mobility reduction because the soil containing metals would be removed from the site. Excavation would achieve RAOs. Although the soil would be disposed of at an offsite facility, toxicity and volume would not be reduced since no treatment of the soil is proposed.

Short-Term Effectiveness. Excavation would achieve the RAOs at the completion of the removal and disposal activities. There is a potential for release of fugitive dusts during the remedial action activities; however, this would be mitigated by developing and implementing appropriate health and safety procedures. Additionally, there may be short-term risks to the public and/or workers during excavation activities through exposure, handling, and transport of the contaminated materials.

Implementability. The Excavation and Offsite Disposal alternative technology is well established and is technically and administratively implementable. There are no site-specific obstacles that would complicate excavation and removal activities.

Cost. Cost estimates are provided in Appendix C. These costs are order-of-magnitude level estimates consistent with EPA requirements for a feasibility study for which cost estimates have an accuracy of plus 50 percent to minus 30 percent. The estimated cost estimate for the excavation and offsite disposal alternative is $76,566.

The cost estimates have been prepared from the best available data at the time of the estimate for guidance in project evaluation and implementation. The final cost of the project would depend on the actual labor and material costs, actual site conditions, final project scope and design, productivity, competitive market conditions, final project schedule, and other variable factors. As a result, the final project costs may vary from those presented in this FFS.

Alternative 4 – Excavation with Onsite Disposal

Description

Alternative 4 is Excavation with Onsite Disposal. Actions to control site-related risks would consist of conducting a pre-design investigation that would include installation of soil borings to determine the excavation geometry. Following the pre-design investigation, soil containing COCs detected above chemical-specific RAOs would be excavated and transported to an onsite location for consolidation and disposal. Confirmation samples would be collected to verify that the site achieves RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Excavation and Onsite Disposal alternative would remove soil containing metals and therefore, would be protective of the environment in the short-term and long-term.

Under this alternative, potential ecological risks would not exist for amphipods because soil containing concentrations metals requiring further action would be removed to meet RAOs.

Operations associated with the excavations would introduce some potential short-term human health risks due to the potential for direct contact or inhalation of the contaminants by workers during excavation activities. However, these risks can be controlled and minimized through proper health and safety procedures.

Compliance with Applicable or Relevant and Appropriate Requirements. The Excavation and Onsite Disposal alternative is expected to satisfy chemical-specific TBC criteria and location- and action-specific ARARs. The action-specific ARARs would be achieved through implementation of appropriate procedures, management practices, dust suppression, and air monitoring during remedial activities. In conjunction with the onsite disposal option, excavated soil would be characterized prior to transport to the onsite consolidation area for disposal. All excavated soil would be managed, handled, and characterized using an approved plan prior to transporting and consolidating onsite.

Long-Term Effectiveness and Permanence. The Excavation and Onsite Disposal alternative is expected to be effective in the long-term because the soil containing metals would be physically removed from the site. This would immediately reduce the site risks. Removal of contaminated soil would be confirmed with confirmation samples. Excavation would provide the greatest degree of effectiveness and permanence at the site because the soil containing the COCs would be removed from the site. However, the soil would be disposed of at an approved onsite consolidation/disposal location; therefore, the contaminants would remain on the BRAC Property.

Reduction of Toxicity, Mobility, or Volume. The Excavation and Onsite Disposal alternative would reduce mobility at the Northwest Runway Area because the soil containing the COCs would be removed from the site and disposed of at an approved onsite location. Excavation would achieve the RAOs and reduce the site risks. However, soil containing the COCs would remain on the BRAC Property. There would not be a reduction, but rather a transfer of toxicity and volume from the Northwest Runway Area to the onsite consolidation site. The engineered cap would reduce infiltration of precipitation and potential contaminant migration. Landfill gases (if present) would be passively vented above the breathing zone.

Short-Term Effectiveness. Excavation would achieve the RAOs at the completion of the removal and disposal activities. There is a potential for release of fugitive dusts during the remedial action activities; however, this would be mitigated by developing and implementing appropriate health and safety procedures. Additionally, there may be short-term risks to the public and/or workers during excavation activities through exposure, handling, and transport of soil.

Implementability. The Excavation and Onsite Disposal technology is well established and is technically and administratively implementable. This alternative may encounter opposition to obtain a permit for installation of a Class II landfill on the BRAC Property. The excavated materials are expected to be nonhazardous, but would be considered designated waste and would require Class II management.

At the Onsite consolidation site, a Class II non-municipal solid waste landfill would have to be designed, permitted, and installed prior to excavating and transporting site soil from the Inboard Area site for disposal. Following consolidation of all the onsite excavated soil, the landfill would require the installation of an engineered cap for closure.

Cost. Cost estimates are provided in Appendix C. These costs are order-of-magnitude level estimates consistent with EPA requirements for a feasibility study for which cost estimates have an accuracy of plus 50 percent to minus 30 percent. The estimated cost for the excavation and onsite disposal alternative is $9,872. This does not include the cost for construction and capping of the consolidation site.

The cost estimates have been prepared from the best available data at the time of the estimate for guidance in project evaluation and implementation. The final cost of the project would depend on the actual labor and material costs, actual site conditions, final project scope and design, productivity, competitive market conditions, final project schedule, and other variable factors. As a result, the final project costs may vary from those presented in this FFS.

Revetment Area

The following presents the detailed evaluation for the No Further Action, Institutional Control, Excavation with Offsite Disposal, and Excavation with Onsite Disposal remedial alternatives for Revetments 1, 2, 3, 4, 6, 7, 11, 12, 13, 14, 15, 16, 19, 20, 21, 22, 23, 24, 25, and 26. The following COCs were identified for each revetment:

- Revetment 1 – Barium, cadmium, lead, and PAHs
- Revetment 2 – Cadmium, lead, and dibenz(a,h)anthracene
- Revetment 3 – Barium, copper, and manganese
- Revetment 4 – Cadmium, lead, acenaphthene, fluorene, and phenanthrene
- Revetment 6 – TPH measured as gasoline, 2-methylnaphthalene, acenaphthen, and fluorene
- Revetment 7 – Lead and 11 PAHs
- Revetment 11 – Copper
- Revetment 12 - Copper
- Revetment 13 – Cadmium, lead, and 9 PAHs
- Revetment 14 – TPH measured as diesel
- Revetment 15 – Cadmium and lead
- Revetment 16 – Barium
- Revetment 19 – Barium, cadmium, copper, lead, TPH measures as diesel and gasoline, and 11 PAHs
- Revetment 20 – Cadmium, phenanthrene, and pyrene
- Revetment 21 – Copper, vanadium, TPH measured as diesel and gasoline, 2-methylnaphthalene, and fluorene

- Revetment 22 – TPH measured as diesel and gasoline, 2-methylnaphthalene, acenaphthene, and fluorene
- Revetment 23 – Copper
- Revetment 25 – Barium and TPH measured as diesel
- Revetment 26 – Barium, boron, manganese, and TPH measures as diesel and gasoline

The COCs identified in the soil at the revetments would pose a potential risk to ecological receptors if these receptors were exposed to COCs during development and maturation of the wetland. The COCs identified at Revetments 13 and 19 would also pose a potential risk to human receptors if these receptors were exposed to COCs during the development and maturation of the wetland. Figures B-16 identifies the area where remedial action is proposed (i.e., the area where residual concentrations of COCs are detected above chemical-specific RAOs) at the Revetments.

Alternative 1 – No Further Action

Description

Alternative 1 is No Further Action. No actions would be initiated to control potential site-related risks.

Assessment

Overall Protection of Human Health and the Environment. The No Further Action alternative would not be protective of human health and the environment in the short- or long-term. Although some of the residual COCs are currently located beneath concrete, potential risks to human health and the environment would exist. The potential risk would exist because a minimum of 3 feet of cover is not provided for the revetments with surface contamination, the potential for erosion or excavation would not be controlled, and the presence of cover would not be monitored. The potential ecological risks for each revetment would exist because exposure to the COCs would not be controlled or mitigated.

Revetments 1, 2, and 4 – Exposure of black rail and amphipods to soil containing metals and PAHs (amphipod only).

Revetment 3 – Exposure of amphipods, salt marsh harvest mouse, algae, pickleweed, and bay shrimp to soil containing metals.

Revetment 6 – Exposure of amphipod to soil containing TPH measured as gasoline, 2-methylnaphthalene, acenaphthene, and fluorene.

Revetment 7 – Exposure of black rail to soil containing lead, and amphipod to soil containing PAHs.

Revetments 11 and 23 – Exposure of salt marsh harvest mouse to soil containing copper.

Revetment 12 – Exposure of salt marsh harvest mouse, bay shrimp, and algae to soil containing copper.

Revetment 13 – Exposure of the black rail to soil containing lead, amphipod to soil containing PAHs, and human exposure to soil containing benzo(a)pyrene from marsh recreation.

Revetment 14 – Exposure of amphipods to soil containing TPH measured as diesel.

Revetment 15 – Exposure to amphipods and black rail to soil containing metals.

Revetment 16 – Exposure of amphipod and algae to soil containing barium.

Revetment 19 – Exposure of algae, salt marsh harvest mouse, and black rail to soil containing metals, and human exposure to benzo(a)pyrene.

Revetment 20 – Exposure of amphipods to soil containing cadmium, phenanthrene, and pyrene.

Revetment 21 – Exposure of salt marsh harvest mouse and pickleweed to soil containing metals, amphipods to soil containing TPH measures as diesel and gasoline, 2-methylnaphthalene, and fluorene.

Revetment 22 – Exposure of amphipods to soil containing TPH measured as diesel and gasoline, 2- methylnaphthalene, acenaphthene, and flourene.

Revetment 25 – Exposure of amphipod to soil containing barium and TPH measured as diesel.

Revetment 26 – Exposure of algae, bay shrimp, and pickleweed to soil containing metals, amphipods to soil containing metals, and TPH measured as diesel and gasoline.

Similarly, potential human health risk (ILCR greater than $1x10^{-6}$) would exist at Revetments 13 and 19 from exposure (marsh recreational scenario) to benzo(a)pyrene. No additional threats would be introduced by this alternative.

Compliance with Applicable or Relevant and Appropriate Requirements. The No Further Action alternative does not achieve the chemical-specific TBC criteria. The COCs would remain in place, and exposure would not be controlled or monitored. Since action is not proposed, there are no action- or location-specific ARARs identified for this alternative.

Long-Term Effectiveness and Permanence. The No Further Action alternative is not expected to be effective in the long-term because no remedial actions are proposed. Potential human health and ecological risks have been identified because COCs would remain in place. Potential exposure to COCs would not be controlled or monitored.

Reduction of Toxicity, Mobility, or Volume. The No Further Action alternative does not include any treatment to reduce toxicity, mobility, or volume. Current estimates suggest that approximately 8,448 yd^3 of soil containing metals, petroleum hydrocarbons, and PAHs would remain in place.

Short-Term Effectiveness. No remedial actions are proposed; therefore, the RAOs would not be achieved. Since no remedial actions are proposed, there would not be any short-term risks to the public, worker, and/or environment.

Implementability. The No Further Action alternative would not have implementation obstacles because remedial actions are not proposed. Implementation of this alternative does not introduce additional risks.

Cost. No costs would be associated with implementing the No Further Action alternative.

Alternative 2 – Institutional Controls

Description

Alternative 2 is Institutional Controls. The goal of this alternative is to protect human health and the environment by eliminating the exposure pathway between residual COCs and future wetland receptors. The institutional controls would detail performance criteria specifying that the final design for the wetland must restrict excavation and erosion and monitor the depth of cover in areas where COCs are detected above chemical-specific RAOs. The final design must maintain at least 3 feet of cover in the areas where COCs are detected above chemical-specific RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Institutional Controls alternative would be protective of human health and the environment in the short- and long-term. COCs are currently present beneath the concrete revetment pads and in surface soil surrounding the concrete revetment. The institutional controls alternative would detail performance criteria specifying that the final design for the wetland must provide a minimum of 3 feet of cover, restrict excavation and erosion, and monitor the depth of cover in areas where COCs are detected above chemical-specific RAOs.

Under this alternative, potential ecological risks would not exist for ecological receptors because exposure to metals, PAHs, and petroleum hydrocarbons would be eliminated through implementation of the final wetland design criteria (providing cover for surface soil contamination, monitoring of cover, and protection against erosion and/or excavation). Similarly, potential human health risk would not exist at Revetments 13 and 19 from exposure (marsh recreation scenario) to benzo(a)pyrene. No additional threats would be introduced by this alternative.

Compliance with Applicable or Relevant and Appropriate Requirements. The performance criteria specified for the Institutional Controls alternative will meet chemical-specific TBC criteria when 3 feet of stable cover cannot be provided. The alternative would prevent and monitor exposure of receptors to concentrations of COCs detected above chemical-specific RAOs. There are no action-specific or location-specific ARARs identified for this alternative.

Long-Term Effectiveness and Permanence. The Institutional Controls alternative is expected to be effective in the long-term through the use of proprietary and governmental controls. The performance criteria specified in the final wetland design would ensure a minimum of 3 feet of cover would be provided (where necessary) and implementation of restrictions on excavation and/or erosion and monitoring of the level of cover throughout the development and maturation of the wetland.

Reduction of Toxicity, Mobility, or Volume. The Institutional Controls alternative does not include any treatment to reduce toxicity, mobility, or volume. Current estimates suggest that approximately 8,448 yd^3 of soil containing COCs would remain in place. However, performance criteria for applying cover, monitoring cover, and prevention of erosion or excavation of cover at the site would eliminate exposure to concentrations of COCs detected above chemical-specific RAOs.

Short-Term Effectiveness. The RAOs to prevent exposure of ecological receptors to COCs and humans to benzo(a)pyrene during marsh recreation (at Revetments 13 and 19) would be

achieved by maintaining at least 3 feet of cover in areas where concentrations of COCs are detected above chemical-specific RAOs in surface soil (see Figure B-16). Potential risks to workers can be controlled and minimized through proper health and safety procedures.

Implementability. The Institutional Controls alternative would have minimal implementation obstacles because the controls would be fully considered and incorporated in preparation of the final wetland design. The performance criteria and monitoring requirements are easily implementable. Enforcement and verification of the recommendations should be a priority.

Cost. Placement of cover and monitoring of the physical development of the wetland are necessary components of the wetland restoration program regardless of the need for remedial action. The performance criteria are designed to provide flexibility in the development and selection of final design and are expected to have only a minor impact on design details. Accordingly, there is no significant incremental cost associated with this alternative.

Alternative 3 – Excavation with Offsite Disposal

Description

Alternative 3 is Excavation with Offsite Disposal remedial alternative. Actions to control site-related risks would consist of conducting a pre-design investigation that would include installation of soil borings to determine the excavation geometry. Following the pre-design investigation, soil concentrations of COCs above chemical-specific RAOs would be excavated, transported, and disposed at an approved off site landfill. Confirmation samples would be collected to verify that the site achieves RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Excavation and Offsite Disposal alternative would remove soil containing PAHs, metals, and petroleum hydrocarbon and therefore, would be protective of human health and the environment in the short-term and long-term.

Operations associated with the excavations would introduce some potential short-term human health risks due to the potential for direct contact or inhalation of the contaminants by workers during excavation activities. However, these risks can be controlled and minimized through proper health and safety procedures.

Compliance with Applicable or Relevant and Appropriate Requirements. The Excavation and Offsite Disposal alternative is expected to satisfy chemical-specific TBC criteria and location- and action-specific ARARs. The action-specific ARARs will be achieved through implementation of appropriate procedures, management practices, dust suppression, and air monitoring during remedial activities. In conjunction with the offsite disposal option, excavated soil will be characterized and compared to land ban restrictions prior to transport and disposal. All excavated soil will be managed, handled, and characterized using an approved plan prior to transporting offsite.

Long-Term Effectiveness and Permanence. The Excavation and Offsite Disposal alternative is expected to be effective in the long-term because soil containing COCs would be physically removed from the site. This would immediately reduce the site risk. Removal of

the soil will be confirmed with confirmation samples. Excavation would provide the greatest degree of effectiveness and permanence because the concentrations of COCs detected above chemical-specific RAOs would be removed from the site and disposed of at an appropriate offsite facility.

Reduction of Toxicity, Mobility, or Volume. The Excavation and Offsite Disposal alternative would provide a high degree of mobility reduction because the soil containing the COCs would be removed from the site. Excavation would achieve the RAOs. Although the soil would be disposed of at an offsite facility, toxicity, and volume would not be reduced since no treatment of the soil is proposed.

Short-Term Effectiveness. Excavation would achieve the RAOs at the completion of the removal and disposal activities. There is a potential for release of fugitive dusts during the remedial action activities; however, would be mitigated by developing and implementing appropriate health and safety procedures. Additionally, there may be short-term risks to the public and/or workers during excavation activities through exposure, handling, and transport of the contaminated materials.

Implementability. The Excavation and Offsite Disposal alternative technology is well established and is technically and administratively implementable. However, the presence of site-specific obstacles, such as concrete revetment pads, may complicate excavation and removal activities.

Cost. Cost estimates for each of the revetments are provided in Appendix C. These costs are order-of-magnitude level estimates consistent with EPA requirements for a feasibility study for which cost estimates have an accuracy of plus 50 percent to minus 30 percent. The estimated cost for the excavation and offsite disposal alternative for each of the revetments is as follows:

- Revetment 1 - $211,033
- Revetment 2 - $142,096
- Revetment 3 - $160,424
- Revetment 4 - $227,718
- Revetment 6 - $112,184
- Revetment 7 - $55,992
- Revetment 11 - $21,516
- Revetment 12 - $14,006
- Revetment 13 - $142,596
- Revetment 14 - $164,622
- Revetment 15 - $94,973
- Revetment 16 - $162,415
- Revetment 19 - $242,280
- Revetment 20 - $170,446
- Revetment 21 - $167,867
- Revetment 22 - $156,872
- Revetment 23 - $226,934
- Revetment 25 - $164,373
- Revetment 26 - $156,810.

The cost estimates have been prepared from the best available data at the time of the estimate for guidance in project evaluation and implementation. The final cost of the project would depend on the actual labor and material costs, actual site conditions, final project scope and design, productivity, competitive market conditions, final project schedule, and other variable factors. As a result, the final project costs may vary from those presented in this FFS.

Alternative 4 – Excavation with Onsite Disposal

Description

Alternative 4 is Excavation with Onsite Disposal. Actions to control site-related risks would consist of conducting a pre-design investigation that would include installation of soil borings to determine the excavation geometry. Following the pre-design investigation, soil containing COCs detected above chemical-specific RAOs would be excavated and transported to an onsite location for consolidation and disposal. Confirmation samples would be collected to verify that the site achieves RAOs.

Assessment

Overall Protection of Human Health and the Environment. The Excavation and Onsite Disposal alternative would be effective in removing the PAH-, metals-, and petroleum hydrocarbon-impacted soil and therefore reducing the potential unacceptable ecological risks that were identified for amphipods, pickleweed, black rail, salmonid, salt marsh harvest mouse, bay shrimp, and algae and unacceptable human health risks identified for marsh recreational receptors to acceptable levels (i.e., less than comparator values).

Operations associated with the excavations would afford a lesser overall short-term protection of human health and the environment due to the potential risks associated with direct contact or inhalation of the contaminants by workers. However, these risks can be controlled and minimized through proper health and safety procedures.

Compliance with Applicable or Relevant and Appropriate Requirements. The Excavation and Onsite Disposal alternative is expected to satisfy chemical-specific TBC criteria and location- and action-specific ARARs. The action-specific ARARs will be achieved through implementation of appropriate procedures, management practices, dust suppression, and air monitoring during remedial activities. In conjunction with the onsite disposal option, excavated soil will be characterized prior to transport to the onsite consolidation area for disposal. All excavated soil will be managed, handled, and characterized using an approved plan prior to transporting and consolidating onsite.

Long-Term Effectiveness and Permanence. The Excavation and Onsite Disposal alternative is expected to be effective in the long-term because soil contaminating COCs will be physically removed from the site. This would immediately reduce the site risk. Removal of contaminated soil would be confirmed with confirmation samples. Excavation would provide the greatest degree of effectiveness and permanence at the site because the soil containing the COCs would be removed from the site. However, the soil would be disposed of at an approved onsite consolidation/disposal location; therefore the contaminates would remain on the BRAC property.

Reduction of Toxicity, Mobility, or Volume. The Excavation and Onsite Disposal alternative would reduce mobility at the Revetment Area because the soil containing COCs would be

removed from the site and disposed of at an approved onsite location. Excavation would achieve the RAOs and reduce the site risks. However, the soil containing COCs would remain on the BRAC Property. There would not be a reduction, but rather a transfer of toxicity and volume from the Revetment Area to the onsite consolidation site. The engineered cap would reduce infiltration of precipitation and potential contaminant migration. Landfill gases (if present) would be passively vented above the breathing zone.

Short-Term Effectiveness. Excavation would achieve the RAOs at the completion of the removal and disposal activities. There is a potential for release of fugitive dusts during the remedial action activities; however, this would be mitigated by developing and implementing appropriate health and safety procedures. Additionally, there may be short-term risks to the public and/or workers during excavation activities through exposure, handling, and transport of the impacted materials.

Implementability. The Excavation and Onsite Disposal technology is well established and is technically and administratively implementable. This alternative may encounter opposition to obtain a permit for installation of a Class II landfill on the BRAC Property. The excavated materials are expected to be nonhazardous, but would be considered designated waste and would require Class II management. The presence of site-specific obstacles, such as the presence of the concrete revetment pads, may complicate excavation and removal activities.

At the onsite consolidation site, a Class II non-municipal solid waste landfill would have to be designed, permitted, and installed prior to excavating and transporting site soil from the Inboard Area sites for disposal. Following consolidation of all the onsite excavated soil, the landfill would require the installation of an engineered cap for closure.

Cost. Cost estimates are provided in Appendix C. These costs are order-of-magnitude level estimates consistent with EPA requirements for a feasibility study for which cost estimates have an accuracy of plus 50 percent to minus 30 percent. The estimated cost for the excavation and onsite disposal alternative for each of the revetments is as follows:

- Revetment 1 - $19,348
- Revetment 2 - $14,226
- Revetment 3 - $16,240
- Revetment 4 - $19,959
- Revetment 6 - $1,227
- Revetment 7 - $814
- Revetment 11 - $8,561
- Revetment 12 - $10,887
- Revetment 13 - $14,246
- Revetment 14 - $17,080
- Revetment 15 - $11,246
- Revetment 16 - $16,312
- Revetment 19 - $21,806
- Revetment 20 - $17,866
- Revetment 21 - $16,486
- Revetment 22 - $18,686
- Revetment 23 - $16,347

- Revetment 25 - $17,070
- Revetment 26 - $17,424.

This does not include the cost for construction and capping of the consolidation site.

The cost estimates have been prepared from the best available data at the time of the estimate for guidance in project evaluation and implementation. The final cost of the project would depend on the actual labor and material costs, actual site conditions, final project scope and design, productivity, competitive market conditions, final project schedule, and other variable factors. As a result, the final project costs may vary from those presented in this FFS.

4.4 Comparative Analysis

The comparative analysis of remedial alternatives evaluated the relative performance of each alternative with respect to seven of the nine specific evaluation criteria presented in Section 4.2. The last two criteria, state (support agency) acceptance and community acceptance, would be addressed in the ROD/RAP. The purpose of the comparative analysis was to identify the advantages and disadvantages of each alternative so that key tradeoffs can be identified.

The first two criteria (overall protectiveness of human health and the environment and compliance with ARARs) serve as threshold determinations in that they must be met by any alternative for it to be eligible for selection. The next five criteria (long-term effectiveness and permanence; reduction of toxicity, mobility, and volume; short-term effectiveness; implementability; and cost), are compared such that major tradeoffs among the alternatives are realized and weighed in the decision-making process. Table 4-2 presents a summary of the comparative analysis.